

MECHANICAL ENGINEERING

**APPARATUS &
TANK CONSTRUCTION**

**HYDRAULICS &
PNEUMATICS**

**SPECIAL MACHINERY
CONSTRUCTION**

FITTINGS CONSTRUCTION

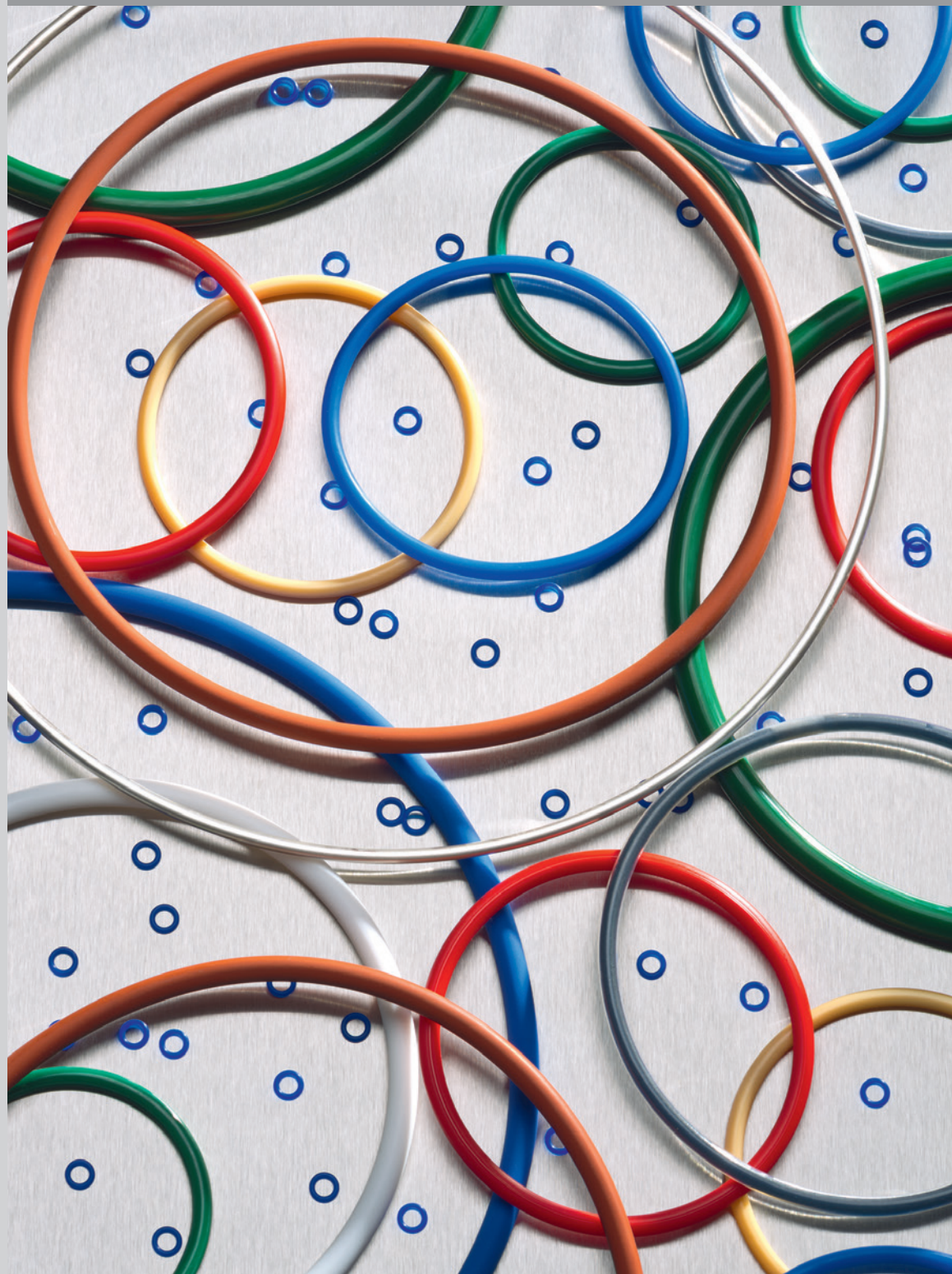
CHEMISTRY

FOOD INDUSTRY

PHARMACY

SANITARY INDUSTRY

MAINTENANCE



WESTRING
DICHTUNGSTECHNIK



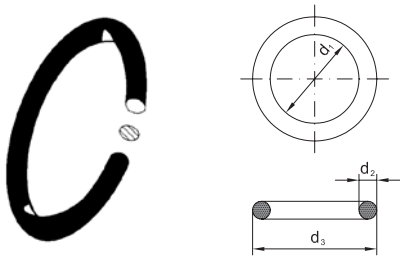
CONTENT

1.	Introduction and mode of action	Page 3
2.	Installation and application mode	Page 3
3.	Hydraulic	Page 3
3.1.	Installation dimensions	Page 3
3.1.1.	Groove dimension guidelines (hydraulic)	Page 4
3.2.	Groove designs and surfaces	Page 5
3.2.1.	Radial groove	Page 5
3.2.2.	Flange seal	Page 6
3.2.3.	Trapezoidal groove	Page 6
3.2.4.	Half trapezoidal groove	Page 6
3.2.4.	Guidelines of the groove dimensions	Page 7
3.2.5.	Triangular groove	Page 7
4.	Pneumatics	Page 8
4.1.	Installation method	Page 8
4.2.	Pneumatic piston – floating installation	Page 9
5.	O-Rings as drive belts	Page 9-10
6.	Vacuum application	Page 10-11
7.	O-Rings in high pressure applications	Page 12
7.1.	Back-up rings	Page 12
7.2.	Back-up rings NBR 90 suitable for precision O-Ring according to ARP	Page 13-14
7.3.	Guidelines for groove dimensions using O-Rings and back-up rings NBR 90 according to ARP	Page 15
7.4.	Guidelines for groove dimensions using metric O-Rings and PTFE back-up rings	Page 15-17
7.5.	Dimensions O-Rings	Page 18-30
7.6.	Standard and stock list precision O-Rings according to ARP (inch)	Page 30-31
8.	Terms from the sealing technology	Page 33
8.1.	Hardness	Page 33
8.2.	Joule effect	Page 33
8.3.	Abrasion	Page 33
8.4.	Coefficient of expansion	Page 33
8.5.	Compression set	Page 34
8.6.	Tightness, technical tightness	Page 34
8.7.	DVI, sealing compatibility index	Page 35
8.8.	Aging	Page 35
9.	Electrical properties of elastomers	Page 36
10.	Corrosion	Page 36
11.	Thermal properties	Page 36-37
12.	Form and surface deviations according to DIN ISO 3601-3	Page 38
13.	Manufacturing process	Page 39
14.	Elastomer materials	Page 39
15.	Specification of rubbers according to DIN ISO 1629 and ASTM 1418	Page 40
16.	Sealing materials O-Rings	Page 40
16.1.	Material overview and properties	Page 41-44
17.	Material compounds for O-Rings	Page 44-48
18.	Approvals	Page 49
19.	Media resistance table for elastomers	Page 49-71
20.	Storage of elastomers	Page 72

1. INTRODUCTION AND MODE OF ACTION

The O-Ring is a sealing element that can reliably prevent leakage of fluids or gases in a wide variety of applications. However, a few basic rules must be observed.

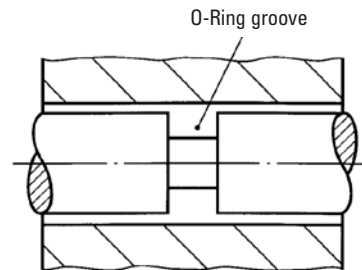
The O-Ring is made of synthetic rubber, is circular and has a round cross-section. Its size is therefore precisely described according to the existing DIN EN 3601 standard with the dimensions inside diameter (d_1) x cord thickness (d_2).



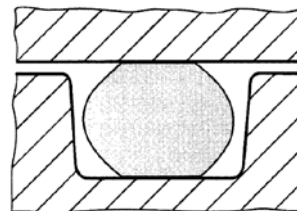
A groove is used to accommodate the O-Ring, the design of which is such that the O-Ring is given a predetermined radial or axial deformation, also known as compression.

This closes the sealing gap between the O-Ring and the mating components and, if correctly designed, as the system pressure increases, by its action on

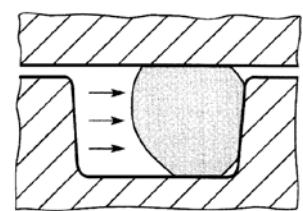
the O-Ring, further increases its contact pressure on the mating components. This additionally supports the sealing effect.



Compressed O-Ring in
Without system pressure



Pressed O-Ring groove
under system pressure

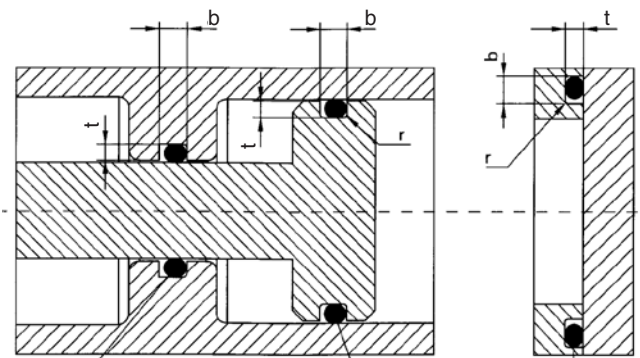


2. INSTALLATION AND APPLICATION METHOD

As shown in the following figure, the O-Ring can be installed with radial or axial compression. The axial compression is usually selected as a flange or cover seal, whereby this is a stationary seal.

The radial seal with the O-Ring groove in the outer part is called a rod seal, whereby this seal can be either moving (dynamic) or fixed (static).

The radial seal with the O-Ring groove in the inner part is called a cylinder or piston seal. Here, too, a dynamic or static seal can be present. This type of seal is also suitable as a cover or bottom seal for a container or cylinder.



inside sealing
(Rod seal)

outside sealing
(Cylinder or piston seal)

axial sealing

3. HYDRAULIC

3.1 INSTALLATION DIMENSIONS

The following table provides guidelines for the design of groove dimensions. The groove dimensions and tolerances given in the table are guide values for O-Rings in NBR 70 Shore A and are intended for orientation purposes.

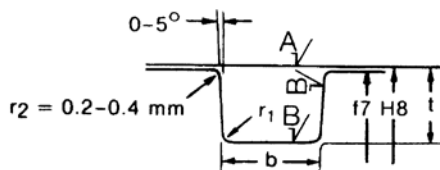
It is essential that these values be checked by the user for the specific application in question, possibly by means of tests. Deviations may occur as a result of contact with the media to be sealed, taking into account the operating temperature and installation conditions.

Particularly in the case of FFKM materials in connection with high-temperature applications, it should be noted that these materials have a special expansion behavior, which can lead to extreme groove filling and thus to destruction of the O-Ring. For these applications, please contact our application engineering department.

HPU polyurethane O-Rings must also be based on different installation dimensions. Please refer to the table under article V1S.

3.1.1. GROOVE DIMENSION GUIDELINES (hydraulic)

Cord size d_2	Radial O-Ring installation			Axial O-Ring installation		Radius r_1 +/- 0,1
	Groove depth dynamic t +/- 0,05	Groove depth static t +/- 0,05	Groove width b + 0,2/0	Groove depth t +/- 0,05	Groove width b +/- 0,2	
1,00	0,75	0,65	1,40	0,70	1,50	0,3
1,50	1,20	1,05	2,10	1,10	2,40	0,3
1,80	1,45	1,30	2,40	1,30	2,70	0,3
2,00	1,65	1,50	2,70	1,45	2,90	0,3
2,50	2,10	1,95	3,40	1,85	3,60	0,3
2,65	2,25	2,05	3,60	2,00	3,90	0,3
3,00	2,55	2,40	4,20	2,30	4,50	0,4
3,55	3,10	2,80	4,80	2,75	5,10	0,5
3,70	3,20	3,00	5,00	2,90	5,15	0,5
4,00	3,50	3,25	5,40	3,10	5,60	0,5
4,30	3,75	3,40	5,80	3,25	5,90	0,6
4,50	3,95	3,60	6,10	3,60	6,20	0,6
5,00	4,45	4,15	6,80	4,10	6,90	0,6
5,30	4,70	4,40	7,20	4,25	7,50	0,6
5,50	4,85	4,50	7,40	4,40	7,70	0,6
5,70	5,00	4,65	7,70	4,60	7,80	1,0
6,00	5,30	4,90	8,10	4,90	8,10	1,0
6,50	5,75	5,35	8,70	5,30	8,40	1,0
7,00	6,20	5,85	9,60	5,70	9,00	1,0
7,50	6,60	6,20	10,00	6,20	9,70	1,0
8,00	7,10	6,60	10,50	6,70	10,20	1,0
9,00	8,00	7,55	12,00	7,60	11,00	1,0
10,00	8,90	8,40	13,00	8,70	12,40	1,0
11,00	9,80	9,25	14,50	9,40	13,80	1,0



3.2 GROOVE DESIGNS AND SURFACES

A good sealing effect and durability of the O-Ring can only be achieved by correctly designed installation spaces and the right choice of material. In any case, please choose an O-Ring with the largest possible cord diameter

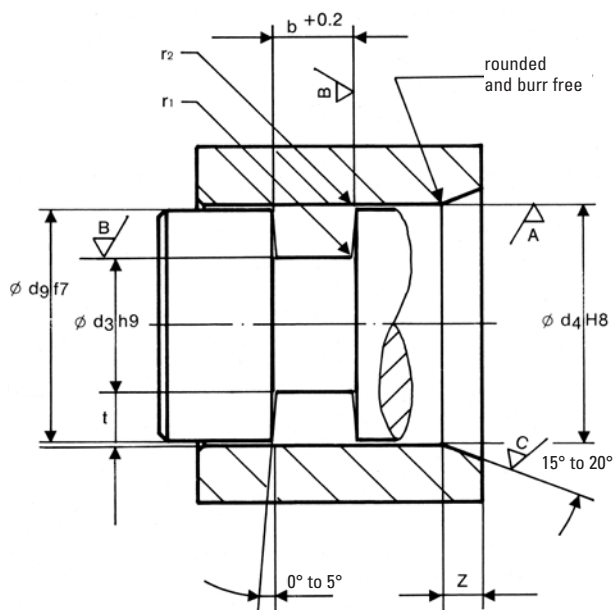
that your design still allows. O-Rings can be stretched max. 6% for your installation as piston seal, for installation as rod seal 2-3% compressed, depending on the ID of the O-Ring.

3.2.1. RADIAL GROOVE

Slight compression when used as a dynamic seal, or slight stretching when used as a dynamic piston seal is even preferable. For dynamic applications or pulsating pressures, abrasion-resistant materials should be used wherever possible. Here we recommend a material hardness between 70° and 80° Shore A. Soft O-Rings have higher wear, harder

O-Rings at pressures up to 15 MPa higher friction. If there is a risk of gap extrusion (migration of the O-Ring between the metal components) at higher pressures depending on the temperature and gap size, back-up rings should be used.

Built-in piston seal (hydraulics + pneumatics)

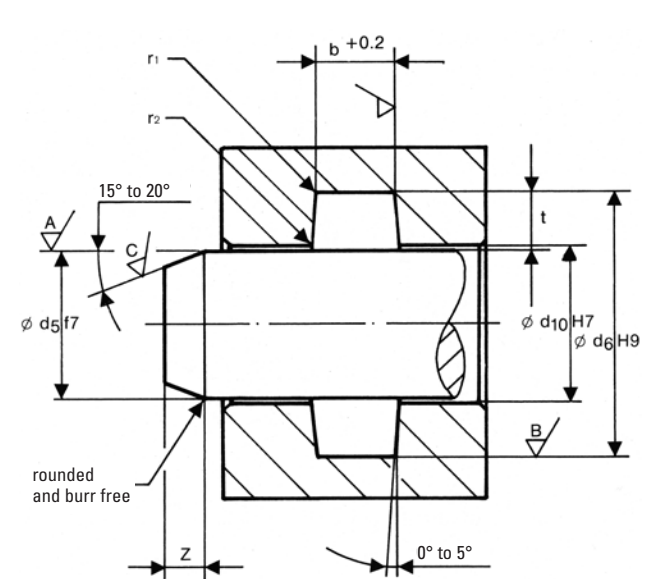


Z = Insertion length ($> d^2 / 2$)

Surface finish for static sealing

Surface	Pressure	Surface roughness in μm , contact ratio $t_p > 50\%$	
		Ra	Rmax
A Contact area	non pulsating	1,6	6,3
	pulsating	0,8	3,2
B Contact area	non pulsating	3,2	12,5
	pulsating	1,6	6,3
C Surface lead-in chamfer		3,2	12,5

Built-in rod seal (hydraulics + pneumatics)



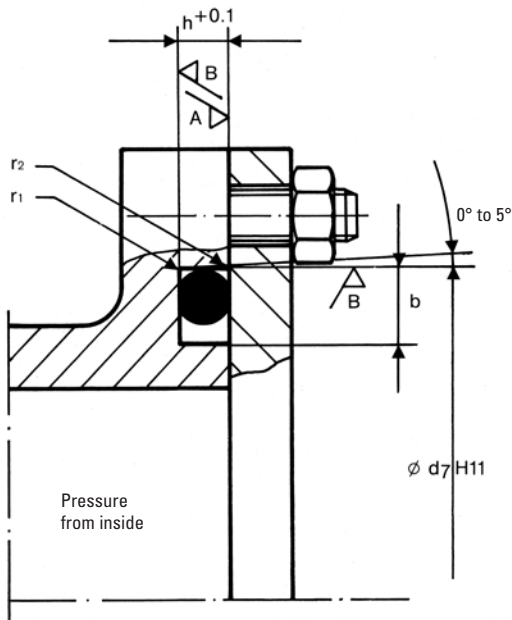
Surface finish for dynamic sealing

Surface	Surface roughness in μm , contact ratio $t_p > 50\%$	
	Ra	Rmax
A Contact area	0,4	1,6
B Contact area	1,6	6,3
C Surface lead-in chamfer	3,2	12,5

3.2.2. FLANGE GASKET

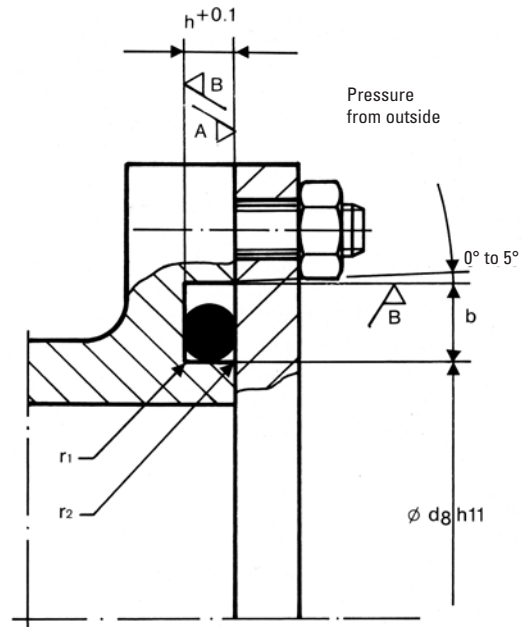
When using the O-Ring as an axial static seal, it should be noted that the O-Ring performs a relative movement towards the non-pressure side under pressure load. As a result, the O-Ring can constantly move in the groove under pulsating pressures and is therefore subject to increased wear on the contact surfaces.

Pressure from inside



Thus, it should be noted that the O-Ring is in contact with the outer diameter of the groove at system internal pressure. Here, too, a compression of 1-3% is to be expected. If the O-Ring seals an external system pressure or has to seal a negative pressure in the system, it should be in contact with the inner diameter of the groove. Here, too, an expansion of the O-Ring of up to 6% should be provided.

Pressure from outside



3.2.3. TRAPEZOIDAL GROOVE

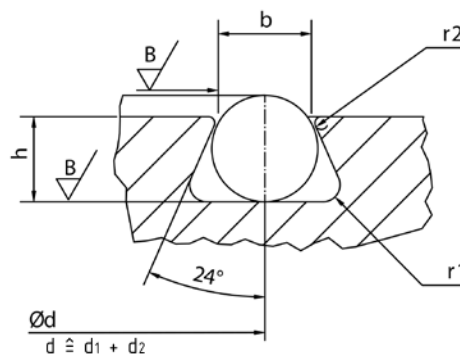
This type of groove shape is selected if the O-Ring has to be held during assembly, service work or when tooling or machines are moved in and out.

However, machining the groove is time-consuming and expensive. In addition, this application is only recommended from a cord diameter of d_2 2,5 mm.

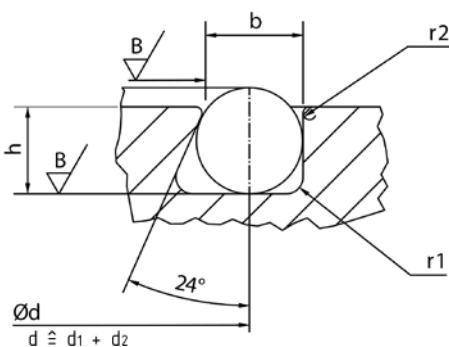
d = Groove center diameter

The groove width b is measured at the edges before deburring.

The radius r^2 must be selected so that the O-Ring is not damaged during insertion and no gap migration occurs at high pressures.



3.2.4. HALF TRAPEZOIDAL GROOVE



Surface		Surface roughness in μm , contact ratio $t_p > 50\%$	
		Ra	Rmax
A Contact area	non pulsating	1,6	6,3
	pulsating	0,8	3,2
B Contact area	non pulsating	3,2	12,5
	+ Groove reason pulsating	1,6	6,3

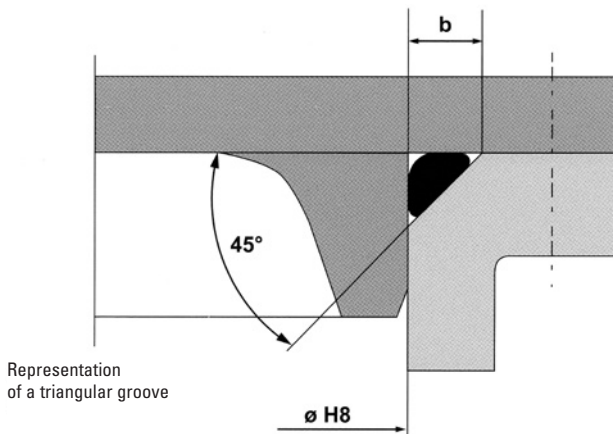
GUIDELINES OF THE GROOVE DIMENSIONS

d_2	Trapezoidal groove $b \pm 0,05$	Trapezoidal groove $h \pm 0,05$	half trapezoidal groove $b \pm 0,05$	half trapezoidal groove $h \pm 0,05$	r_2	r_1
1,80	1,40	1,25	1,60	1,30	0,1	0,4
2,50	2,30	2,00	2,40	2,00	0,2	0,4
2,65	2,40	2,10	2,40	2,05	0,2	0,4
3,00	2,70	2,40	2,80	2,40	0,2	0,4
3,55	3,20	2,80	3,10	2,85	0,2	0,6
4,00	3,70	3,10	3,80	3,00	0,3	0,8
5,00	4,40	4,00	4,60	4,10	0,3	0,8
5,33	4,80	4,20	4,80	4,35	0,4	0,8
6,00	5,50	4,80	5,60	5,10	0,4	0,8
7,00	6,50	5,60	6,50	5,90	0,4	1,6
8,00	7,50	6,50	7,50	6,30	0,4	1,6

3.2.5. TRIANGULAR GROOVE

Sealing by means of a triangular groove is found in flange and lid seals. In this installation space, the O-Ring rests on three contact surfaces. Defined contact pressure of the O-Ring is only guaranteed to a limited extent. Also, the specified tolerances in the manufacture of the groove, so that

the sealing function is not always perfect. In addition, this groove design offers little room for swelling of the O-Ring, which is to be expected due to temperature and the medium to be sealed, which acts on the O-Ring.



d_2	b	r
1,80	2,40 +0,10	0,3
2,00	2,70 +0,10	0,4
2,50	3,40 +0,15	0,6
2,62	3,50 +0,15	0,6
3,00	4,00 +0,20	0,6
3,53	4,70 +0,20	0,9
4,00	5,40 +0,20	1,2
5,00	6,70 +0,25	1,2
5,33	7,10 +0,25	1,5
6,00	8,00 +0,30	1,5
7,00	9,40 +0,30	2,0
8,00	10,80 +0,30	2,0
8,40	11,30 +0,30	2,0
10,00	13,60 +0,35	2,5

4. PNEUMATICS

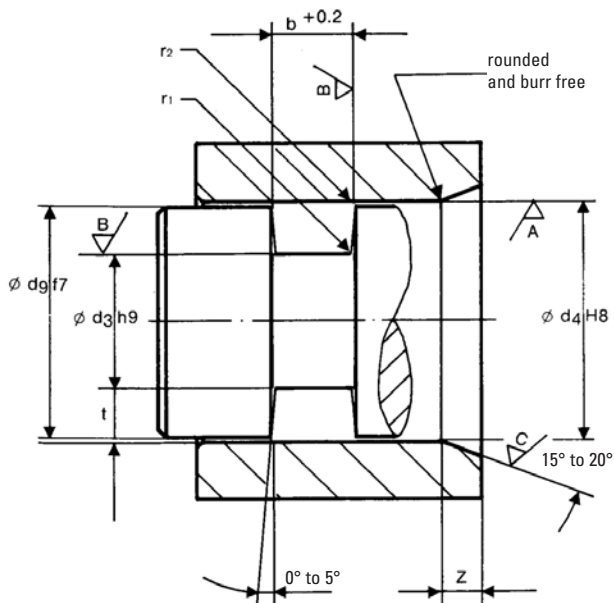
4.1. INSTALLATION DIMENSIONS

Interest in pneumatic systems has grown steadily in recent years. New systems, as well as the partial replacement of hydraulic systems with pneumatic systems, are being developed for the following reasons:

- Less expensive
- the pressure medium air does not decompose at higher temperatures
- low environmental impact in case of leakage
- non-flammable, low-cost pressure medium
- lower weight

Compared to hydraulics, the average compression of the O-Ring cross-section is somewhat reduced in order to keep the resulting friction as low as possible. The minimum compression of the O-Ring cross-section is normally 4 to 7%, and results from taking all tolerances into account.

Installation space piston seal – pneumatics



Z = Insertion length ($> d_2 / 2$)

d_2	t^*	$b + 0,20$	z	r_1	r_2
1,80	1,55	2,30	1,50	0,20	0,10
2,65	2,35	3,10	1,50	0,40	0,10
3,55	3,15	4,20	1,80	0,40	0,20
5,30	4,85	6,40	2,70	0,60	0,25
7,00	6,40	8,40	3,60	1,20	0,30

* the tolerance results from $d_3 h_9 + d_4 H_8$ or $d_5 f_7 + d_6 H_9$

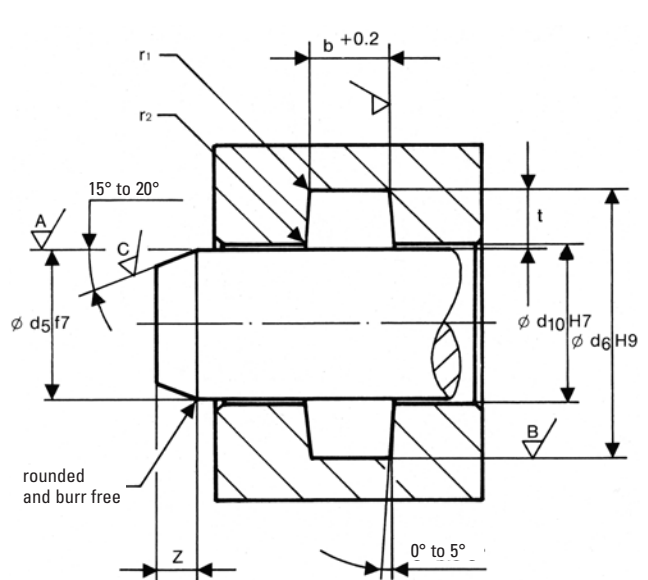
$$\frac{(d_{2min} - t_{max}) \times 100}{d_{2min}} \geq 4 (\%)$$

d_{2min} = Minimum cross section t_{max} = Maximum groove depth

Here, too, the O-Ring can be compressed by 1 to 3 % on the outside diameter if it is used as a rod seal. When used as a piston seal, expansion of up to max. 6 % is possible. A number of special compounds with improved friction values are available for pneumatic applications.

Please contact our application engineers for this purpose. Only O-Rings with a hardness of 70° to 80° Shore A should be used.

Installation space rod seal – pneumatics



Surface	Surface roughness in μm , contact ratio $t_p > 50\%$	
	Ra	Rmax
A Contact area	0,40	1,60
B Contact area	1,60	6,30
C Surface lead-in chamfer	3,20	12,50

4.2. PNEUMATIC PISTONS – FLOATING INSTALLATION

A pneumatic piston is usually manufactured with a floating O-Ring whose profile cross-section is not pressed. This reduces friction, which has a positive effect on the wear of the O-Ring and allows the piston to move smoothly.

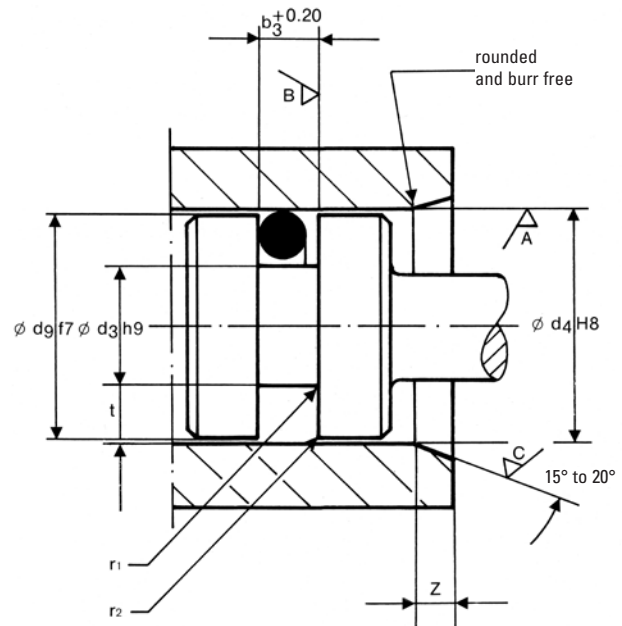
d_2	t^*	$b + 0,20$	z	r_1	r_2
1,80	1,55	2,30	1,50	0,20	0,10
2,65	2,35	3,10	1,50	0,40	0,10
3,55	3,15	4,20	1,80	0,40	0,20
5,30	4,85	6,40	2,70	0,60	0,25
7,00	6,40	8,40	3,60	1,20	0,30

* the tolerance results from d_3h9+d_4H8 or d_5f7+d_6H9

For the surface finishes, please refer to the table above (pneumatics).

To achieve a sealing function, the outer diameter of the O-Ring must be slightly larger than the cylinder bore. The inner diameter of the O-Ring must not rest on the groove base of the piston. The groove depth should be approx. 10% larger than the O-Ring cord diameter (see table).

When the pressure builds up, this system may leak slightly, but this leads to a reduction in leakage and an increase in the sealing effect as the system pressure increases and the O-Ring is pressed harder against the two contact surfaces. The material hardness of the O-Ring should not exceed 70° to 80° Shore A. With this selection, an operating pressure of 1.6 MPa at max. 80° C must be realized.



Please contact our application engineering department, which will assist you in the selection of the material and a possible coating, which serves to reduce wear and friction.

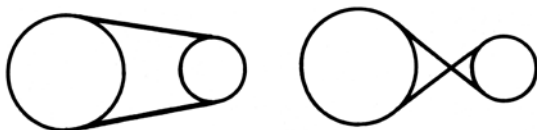
In the case of high-performance pneumatics, however, we refer in any case to the profiles specially developed for this purpose in our catalog Rod and Cylinder Seals for Pneumatics.

5. O-RINGS AS DRIVE BELTS

For the transmission of low torques in drive technology, O-Rings can also be used very well as belt drives.

- Thus, the O-Ring has decisive advantages for this application:
- cost-effective alternative to belts
- simple assembly
- flexible application possibilities
- constant tensile forces
- no need for belt tensioners due to the elastic properties
- larger position tolerances of the pulleys
- fast procurement

However, not all materials are suitable for this application, since the flexing work to which the O-Ring is subjected destroys the molecular chains of the elastomer through ozone and oxygen.



open version

crossed design

Therefore, the selection of the elastomer must meet the following criteria:

- good aging resistance
- abrasion resistance
- low tendency to contract under tension and temperature (Joule effect)
- good flexural flexibility

The O-Ring material should also have the property of having the lowest possible relaxation of stress in the stretched state (stress relaxation) and maximum dynamic behavior.

Please also take into account any existing environmental influences such as ozone, oils, greases, and the existing temperature.

O-RINGS AS DRIVE BELTS

The following materials are suitable for use as power transmission belts:

EP540: an ethylene-propylene-diene rubber (EPDM).

In any case, a peroxide cross-linked material with approx. 80° Shore A should be used. However, this material is not resistant to mineral oil!

CE557: a chloroprene rubber (CR)

CR is resistant to mineral oil and grease. However, its dynamic behavior is not as good as that of EPDM and PUR. However, it offers comparable stress relaxation to EPDM.

SI720: a silicone rubber (MVQ)

Abrasion and tensile strength are lower compared to the other materials, but can be used at somewhat higher temperatures.

PU008: a polyurethane rubber (PU; PUR)

PU is characterized by particularly high tensile strength, abrasion resistance and thus longer durability. The service temperature resistance is approx. 55°C, depending on the existing humidity.

For the technical execution, design of the pulleys and determination of the necessary pretension, and the resulting lengths and required O-Ring sizes, please contact our application engineering department.

For use with long drive belts and wide center distances of the pulleys, we would like to draw your attention to our product of polyurethane round cords.

Here PUR round cords are available in various hardnesses and qualities, in diameters between 2 and 20 mm. The surface is either smooth or roughened. There is hollow round cord which is mechanically joined to form a closed drive belt, or solid round cord which is joined by welding.

6. VACUUM APPLICATION

O-Rings are also very well suited for use in vacuum technology, but in contrast to other applications, some special features must be observed here.

- In vacuum applications, the O-Ring should almost completely fill the groove when pressed, so that all contact surfaces in the groove can be used as sealing surfaces. The increase in the contact areas thus extends the diffusion time through the elastomer.
- This requires an increased surface quality for all groove surfaces. The contact ratio t_p should be greater than 50% (see surface quality table).
- The compression ratio of the O-Ring should be approx. 30%.
- Materials should also be used for the O-Ring that are characterized by a low gas permeation coefficient (permeation), and a good compression set value, as well as a low weight loss due to gas permeation.
- Permeation can be reduced with suitable greases for vacuum applications.
- A very high requirement for low gas permeation, may require the arrangement of two O-Rings in series.

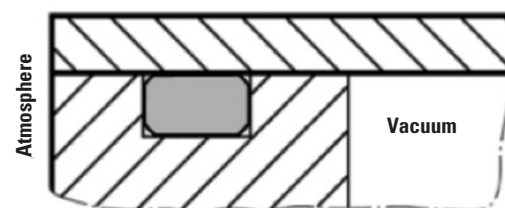
In most cases, therefore, a good FKM material with a hardness of at least 80 Shore A should be used for vacuum applications. At higher temperatures, the FFKM material is also becoming increasingly important. Here, due to thermal expansion, the following must be observed, that the groove

filling is not exceeded. Please contact our application engineering department in case of such operating conditions.

Due to the necessary grouting and the groove filling, which should be slightly below 100%, the requirements for dimensional accuracy for the O-Ring, especially for the cross-section, are very high. It is essential that the tolerances of DIN EN 3601 are observed. Round butt vulcanized O-Rings are therefore unsuitable.

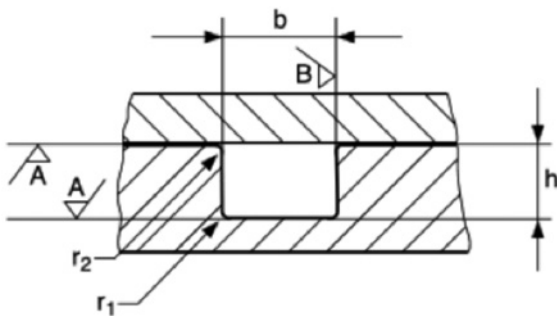
In all cases, compatibility with the media to be sealed must be checked.

Principle illustration of groove filling in a static vacuum seal



GROOVE DIMENSION GUIDELINES (Vacuum application static)

O-Ring cord thickness d_{2+} (mm)	Groove depth h -0,05 (mm)	Groove depth b +/- 0,05 (mm)	Radius r_1 (mm)	Radius r_2 (mm)
1,5	1,05	1,8	0,2	0,1
1,78	1,25	2,1	0,2	0,1
1,8	1,25	2,1	0,2	0,1
2	1,4	2,3	0,3	0,1
2,5	1,75	2,9	0,3	0,1
2,62	1,85	3,1	0,4	0,1
2,7	1,9	3,15	0,4	0,1
2,8	1,95	3,2	0,4	0,1
3	2,1	3,5	0,5	0,1
3,1	2,2	3,6	0,5	0,1
3,2	2,25	3,7	0,5	0,2
3,5	2,45	4,1	0,5	0,2
3,53	2,5	4,1	0,5	0,2
3,6	2,5	4,2	0,5	0,2
3,7	2,6	4,3	0,5	0,2
4	2,8	4,7	0,5	0,2
4,5	3,15	5,3	0,8	0,2
5	3,5	5,9	0,8	0,2
5,33	3,7	6,3	0,8	0,2
5,5	3,8	6,6	1	0,2
5,7	4	6,7	1	0,2
6	4,2	7,1	1	0,2
6,5	4,6	7,6	1	0,3
6,99	4,9	8,2	1	0,3
7	4,9	8,2	1	0,3
7,5	5,3	8,7	1	0,3
8	5,6	9,4	1	0,3
8,4	5,9	9,9	1	0,3
8,5	6	10	1	0,3
9	6,4	10,5	1	0,3
9,5	6,7	11,2	1	0,3
10	7,1	11,7	1	0,3

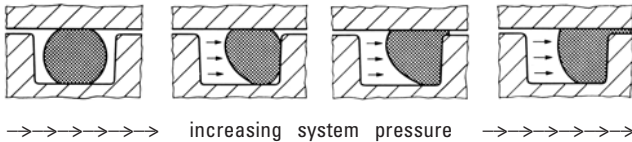

Table surface finish

	Surface roughness, contact ratio $t_p > 50\%$			
	Contact area A		Groove flanks B	
	R_a	R_{max}	R_a	R_{max}
Vacuum	0,8	3,2	1,6	6,3
bis 10^{-8} Torr	0,4	1,6	1,6	6,3
Bis 10^{-11} Torr	0,1	0,4	1,6	6,3

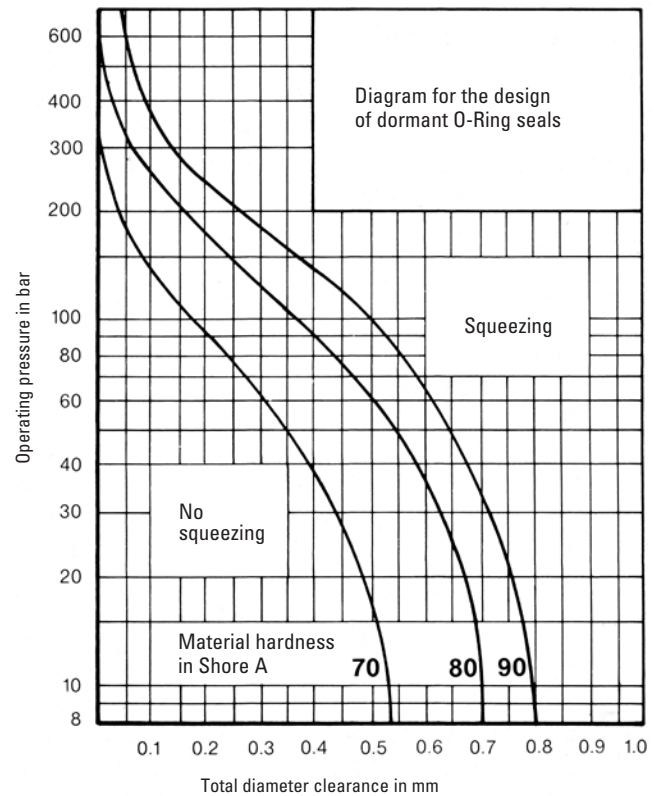
7.5. O-RINGS IN HIGH-PRESSURE APPLICATIONS

O-Rings have the property under high pressure to penetrate into the gap between the machine components. The lower the hardness of the O-Ring material, or with very small cord diameters of the O-Rings, this behavior is very pronounced. This behavior is also favored when used at higher temperatures.

This can very quickly lead to damage of the O-Ring and thus to leakage in both static and dynamic applications with high or pulsating pressures.



The O-Ring penetrates more and more into the gap as the pressure increases (gap extrusion). When the pressure is subsequently relieved, it moves back to its original position. This then damages the O-Ring at the section of its cross-section that was in the gap between the machine parts, resulting in leakage. In a dynamic application, where the machine parts move relative to each other, the cross-section of the O-Ring in the gap is sheared off.



7.1. SUPPORT RINGS

In many applications, it is not advisable to simply use a harder O-Ring because of the requirements, such as low friction in dynamic applications, or high low-temperature flexibility, or bridging of larger gaps.

In this case, the use of a back-up ring is recommended to prevent this gap extrusion. This is always mounted next to the O-Ring on the side away from the pressure to protect the O-Ring against gap migration. If the O-Ring is pressurized on both sides, the back-up ring is mounted on both sides.

The back-up rings are therefore made either of NBR with 90° Shore A, polyurethane with 95° Shore A, or PTFE with various fillers, or also

polyimid.

To match the O-Rings in inch dimensions according to ARP, as per the attached standard and stock list, there are endless NBR 90° Shore A back-up rings, concave on one side and in closed design.

Advantage: These are easy to fit in closed grooves, with the concave side surface centering the O-Ring.

7.2. SUPPORT RINGS NBR 90 SUITABLE FOR PRECISION O-RING ACCORDING TO ARP (INCH)

1.35 mm		2.18 mm		3.00 mm		4.65 mm		5.99 mm	
Order-No.	M mm	Order-No.	M mm	Order-No.	M mm	Order-No.	M mm	Order-No.	M mm
8-004	2.44	8-102	1.96	8-201	5.13	8-309	11.43	8-425	115.60
8-005	3.23	8-103	2.77	8-202	6.73	8-310	13.03	8-426	118.77
8-006	3.56	8-104	3.56	8-203	8.30	8-311	14.60	8-427	121.95
8-007	4.34	8-105	4.34	8-204	9.90	8-312	16.20	8-428	125.20
8-008	5.13	8-106	5.13	8-205	11.56	8-313	17.78	8-429	128.30
8-009	5.94	8-107	5.94	8-206	13.16	8-314	19.38	8-430	131.47
8-010	6.73	8-108	6.73	8-207	14.73	6-315	20.96	8-431	134.65
8-011	8.31	8-109	8.31	8-208	16.33	8-316	22.56	8-432	137.82
8-012	9.91	8-110	9.91	8-209	17.90	8-317	24.13	8-433	141.00
8-013	11.56	8-111	11.48	8-210	19.46	8-318	25.73	8-434	144.17
8-014	13.16	8-112	13.08	8-211	21.03	8-319	27.31	8-435	147.35
8-015	14.73	8-113	14.66	8-212	22.63	8-320	28.91	8-436	150.52
8-016	16.33	8-114	16.26	8-213	24.21	8-321	30.42	8-437	153.70
8-017	17.91	8-115	17.83	8-214	25.81	8-322	32.08	8-438	159.36
8-018	19.51	8-116	19.43	8-215	27.38	8-323	33.43	8-439	165.71
8-019	21.08	8-117	21.11	8-216	28.98	8-324	35.26	8-440	172.06
8-020	22.68	8-118	22.68	8-217	30.56	8-325	38.43	8-441	178.41
8-021	24.26	8-119	24.28	8-218	32.16	8-326	41.61	8-442	184.76
8-022	25.86	8-120	25.86	8-219	33.88	8-327	44.78	8-443	191.11
8-023	27.43	8-121	27.46	8-220	35.48	8-328	47.96	8-444	197.46
8-024	29.03	8-122	29.03	8-221	37.06	8-329	51.13	8-445	203.81
8-025	30.61	8-123	30.63	8-222	38.66	8-330	54.31	6-446	216.51
8-026	32.21	8-124	32.21	8-223	41.83	8-331	57.61	8-447	229.21
8-027	33.78	8-125	33.81	8-224	45.01	8-332	60.78	8-448	241.91
8-028	35.38	8-126	35.38	8-225	48.18	8-333	63.96	8-449	254.61
8-029	38.56	8-127	36.98	8-226	51.36	8-334	67.13	8-450	267.31
8-030	41.73	8-128	38.56	8-227	54.53	8-335	70.31	8-451	280.01
8-031	44.91	8-129	40.16	8-228	57.71	8-336	73.48	8-452	292.71
8-032	48.08	8-130	41.73	8-229	60.88	8-337	76.66	8-453	305.41
8-033	51.26	8-131	43.33	8-230	64.06	8-338	79.83	8-454	318.11
8-034	54.43	8-132	44.91	8-231	66.83	8-339	83.13	8-455	330.81
8-035	57.61	8-133	46.51	8-232	70.00	8-340	86.31	8-456	343.51
8-036	60.78	8-134	48.08	8-233	73.18	8-341	89.48	8-457	356.21
8-037	63.96	8-135	49.68	8-234	76.35	8-342	92.66	8-458	368.91
8-038	67.13	8-136	51.26	8-235	79.53	8-343	95.83	8-459	381.61
8-039	70.31	8-137	52.86	8-236	82.70	8-344	99.01	8-460	394.31
8-040	73.48	8-138	54.43	8-237	85.88	8-345	102.31	8-461	406.50
8-041	76.66	8-139	56.03	8-238	89.05	8-346	105.49	8-462	419.20
8-042	83.01	8-140	57.61	8-239	92.23	8-347	108.66	8-463	431.90
8-043	89.36	8-141	59.21	8-240	95.40	8-348	111.84	8-464	444.60
8-044	95.71	8-142	60.78	8-241	98.58	8-349	115.01	8-465	457.30
8-045	102.06	8-143	62.38	8-242	101.75	8-350	118.19	8-466	470.00
8-046	108.41	8-144	63.96	8-243	104.93	8-351	121.36	8-467	482.70
8-047	114.76	8-145	65.56	8-244	108.10	8-352	124.54	8-468	495.40
8-048	121.11	8-146	67.13	8-245	111.28	8-353	127.71	8-469	508.10
8-049	127.46	8-147	68.73	8-246	114.45	8-354	130.89	8-470	533.50
8-050	133.81	8-148	70.31	8-247	117.63	8-355	134.09	8-471	558.90
		8-149	71.91	8-248	121.11	8-356	137.24	8-472	584.30
		8-150	73.48	8-249	124.28	8-357	140.41	8-473	609.70
		8-151	76.66	8-250	127.46	8-358	143.59	8-474	635.10
		8-152	83.01	8-251	130.63	8-359	146.76	8-475	660.50
		8-153	89.36	8-252	133.81	8-360	149.94		
		8-154	95.71	8-253	136.98	8-361	153.11		
		8-155	102.06	8-254	140.16	8-362	159.46		
		8-156	108.41	8-255	143.33	8-363	165.81		
		8-157	114.76	8-256	146.51	8-364	172.16		
		8-158	121.11	8-257	149.68	8-365	178.51		
		8-159	127.46	8-258	152.86	8-366	184.86		
		8-160	133.81	8-259	159.21	8-367	191.21		
		8-161	140.16	8-260	165.56	8-368	197.56		
		8-162	146.51	8-261	171.91	8-369	203.91		
		8-163	152.86	8-262	178.26	8-370	210.26		

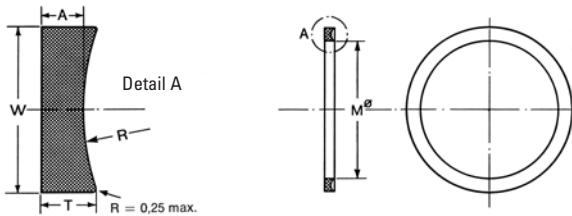
Please note: Please always specify material and size. The respective O-Ring order numbers match the respective back-up ring order numbers.

SUPPORT RINGS NBR 90 SUITABLE FOR PRECISION O-RING ACCORDING TO ARP (INCH)

1.35 mm		2.18 mm		3.00 mm		4.65 mm		5.99 mm	
Order-No.	M mm	Order-No.	M mm	Order-No.	M mm	Order-No.	M mm	Order-No.	M mm
		8-164	159.21	8-263	184.61	8-371	216.61		
		8-165	165.56	8-264	190.96	8-372	222.96		
		8-166	171.91	8-265	197.31	8-373	229.31		
		8-167	178.26	8-266	203.66	8-374	235.66		
		8-168	184.61	8-267	210.01	8-375	242.01		
		8-169	190.96	8-268	216.36	8-376	248.36		
		8-170	197.31	8-269	222.71	8-377	254.71		
		8-171	203.66	8-270	229.06	8-378	267.41		
		8-172	210.01	8-271	235.41	8-379	280.11		
		8-173	216.36	8-272	241.76	8-380	292.81		
		8-174	222.71	8-273	248.11	8-381	305.51		
		8-175	229.06	8-274	254.46	8-382	330.91		
		8-176	235.41	8-275	267.16	8-383	356.31		
		8-177	241.76	8-276	279.86	8-384	381.71		
		8-178	248.11	8-277	292.56	8-385	406.60		
				8-278	305.26	8-386	432.00		
				8-279	330.66	8-387	457.40		
				8-280	356.05	8-388	482.75		
				8-281	381.46	8-389	508.15		
				8-282	406.12	8-390	533.55		
				8-283	431.52	8-391	558.95		
				8-284	456.92	8-392	584.02		
						8-393	609.42		
						8-394	634.82		
						8-395	660.22		

Please note: Please always specify material and size. The respective O-Ring order numbers match the respective back-up ring order numbers.

Profile cross section and dimensions of NBR 90 back-up rings



Other dimensions

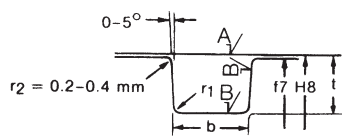
Order-No.	R mm	Order-No.	T mm	Order-No.	A mm	Tolerance ± mm	Order-No.	W mm	Tolerance ± mm
004-050	2.21	004-050	1.24	004-050	1.14	0.08	004-050	1.35	0.08
102-178	3.28	102-178	1.35	102-178	1.14	0.08	102-178	2.18	0.08
201-284	4.42	201-284	1.27	201-284	1.02	0.08	201-284	3.00	0.10
309-395		309-395	1.93	309-395	1.52	0.10	309-395	4.65	0.13
6.65		425-475	2.97	425-475	2.44	0.13	425-475	5.99	0.15
425-475	8.74								

Dimensional tolerances for M

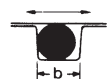
Order-No.	Tolerance ±	Order-No.	Tolerance ±	Order-No.	Tolerance ±	Order-No.	Tolerance ±	Order-No.	Tolerance ±
004-009	0.15 mm	102-107	0.15 mm	165-178	0.74 %	260-277	0.74 %	363-380	0.74 %
009-012	0.18 mm	108-110	0.18 mm	201-204	0.18 mm	278-284	0.67 %	381-395	0.67 %
012-019	0.23 mm	111-117	0.25 mm	204-211	0.25 mm	309-315	0.25 mm	425-438	0.78 %
020-029	1.00 %	118-128	1.10 %	212-227	1.10 %	316-325	1.10 %	439-452	0.74 %
030-041	0.86 %	129-151	0.95 %	228-235	0.90 %	326-338	0.95 %	453-475	0.67 %
042-050	0.78 %	152-164	0.78 %	236-259	0.78 %	339-362	0.78 %		

7.3. GUIDELINES FOR GROOVE DIMENSIONS USING O-RINGS AND SUPPORT RINGS NBR 90 ACCORDING TO ARP

Please note: the following installation table applies to this type of back-up rings




Pressure directions




without support ring

Pressure directions



one support ring

Pressure directions



two support rings

Cord strength d_2 mm	Groove depth t/mm			Groove width in mm $\begin{pmatrix} +0,2 \\ 0 \end{pmatrix}$			Radius r_1 mm
	static	dyn. hyd.	dyn. pneu.	b without support ring	b_1 with 1 support ring	b_2 with 2 support rings	
1,00	0,65 ±0,05	0,75 ±0,02	0,80 ±0,02	1,4	2,4	3,4	0,2-0,4
1,50	1,05 ±0,05	1,20 ±0,02	1,25 ±0,02	2,0	3,0	4,0	0,2-0,4
1,80	1,30 ±0,05	1,45 ±0,02	1,55 ±0,02	2,4	3,4	4,4	0,2-0,4
2,00	1,50 ±0,05	1,65 ±0,02	1,75 ±0,02	2,7	3,7	4,7	0,2-0,4
2,50	1,95 ±0,05	2,10 ±0,02	2,20 ±0,02	3,4	4,9	6,4	0,2-0,4
2,65	2,05 ±0,05	2,25 ±0,02	2,35 ±0,02	3,6	5,1	6,6	0,2-0,4
3,00	2,40 ±0,05	2,55 ±0,02	2,70 ±0,02	4,2	5,7	7,2	0,2-0,4
3,50	2,80 ±0,07	3,05 ±0,05	3,20 ±0,05	4,8	6,3	7,8	0,3-0,6
3,55	2,85 ±0,07	3,10 ±0,05	3,25 ±0,05	4,8	6,3	7,8	0,3-0,6
4,00	3,25 ±0,07	3,50 ±0,05	3,65 ±0,05	5,4	6,9	8,4	0,3-0,6
5,00	4,15 ±0,10	4,45 ±0,05	4,65 ±0,05	6,8	8,8	10,8	0,3-0,6
5,30	4,40 ±0,10	4,70 ±0,05	4,90 ±0,05	7,2	9,2	11,2	0,6-1,0
7,00	5,85 ±0,10	6,25 ±0,05	6,55 ±0,05	9,6	12,1	14,6	0,6-1,0

Surface A	static $R_a = 1,6 \mu\text{m}$ and $R_{max} = 6,3 \mu\text{m}$ Load-bearing component $t_p > 50 \%$	dynamic $R_a = 0,4 \mu\text{m}$ and $R_{max} = 1,6 \mu\text{m}$ Load-bearing component $t_p > 50 \%$
Surface B	static $R_s = 3,2 \mu\text{m}$ and $R_{max} = 12,5 \mu\text{m}$ Load-bearing component $t_p > 50 \%$	dynamic $R_a = 1,6 \mu\text{m}$ and $R_{max} = 6,3 \mu\text{m}$ Load-bearing component $t_p > 50 \%$

7.4. GUIDELINES FOR GROOVE DIMENSIONS USING METRIC O-RINGS AND PTFE BACK-UP RINGS

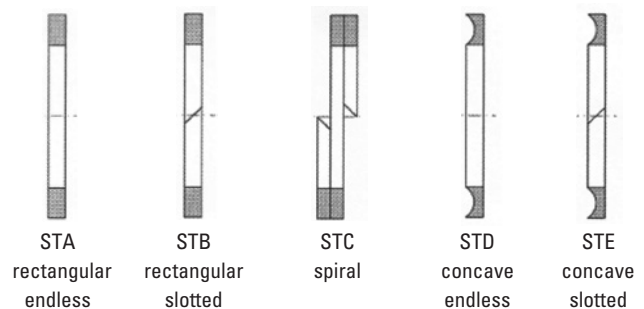
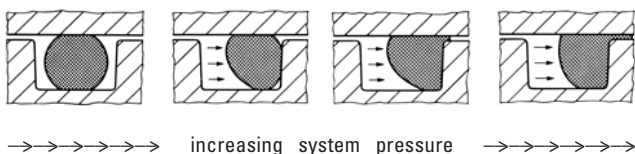
PTFE back-up rings are used to prevent gap extrusion (gap migration) of O-Rings or WX-rings at high pressures, and thus to prevent damage to the elastomer sealing elements. Particularly in dynamic applications without a back-up ring, gap extrusion with simultaneous movement of the metal components leads to immediate damage to the sealing surfaces. However, pulsating pressures during static sealing also have the same effect. Slotted and spiral forms can be easily inserted into a closed groove, whereas an open (separable) installation space should preferably be provided for endless designs. For high and pulsating pressures, we recommend endless designs.

To avoid this gap extrusion, the support ring is always installed on the side facing away from the pressure (see illustration). In double-acting systems, to the right and left of the sealing element.



The support rings are manufactured in various designs.

Schematic representation of the column immigration:



GUIDELINES FOR GROOVE DIMENSIONS USING METRIC O-RINGS AND PTFE BACK-UP RINGS

STA – unslotted

- rectangular profile
- endless
- for split grooves and larger diameters
- for static use as well as axial stroke movements or slow rotary movements

STB – slotted

- rectangular profile
- split with bevel cut 30° or 45°
- if profile STA cannot be mounted due to closed grooves or small diameter
- for static use as well as axial stroke movements or slow rotary movements

STC – spiral

- rectangular profile
- with oblique cut 30° or 45°
- if profile STA cannot be mounted due to closed grooves or small diameter
- for static use as well as axial stroke movements
- in case of large temperature fluctuations
- bridging of larger tolerance changes

STD – concave unslotted

- concave profile
- endless
- for split grooves and larger diameters
- Enlargement of the contact surface thereby protection of the O-Ring at pulsating pressures
- O-Ring remains dimensionally stable, increasing service life and sealing force of the O-Ring
- for static use as well as axial stroke movements or slow rotary movements

STE – concave slotted

- concave profile
- slotted 30° or 45°
- for closed grooves and smaller diameters
- Enlargement of the contact surface thus protection of the O-Ring in case of pulsating pressures
- O-Ring remains dimensionally stable, which increases the service life and sealing force of the O-Ring
- For static use as well as axial stroke movements or slow rotary movements

In general, the use of back-up rings is recommended when the following operating conditions are present:

- Pressure greater than 7 MPa (70 bar)
- gap dimension greater than 0.25 mm from pressure p g 1 MPa (10 bar)
- high temperatures
- high stroke frequencies
- strong pulsation

Advantages are:

- can be produced at short notice
- many PTFE + plastic as well as PU materials available
- easily adaptable to existing operating conditions and installation spaces
- wide temperature range can be covered
- universal chemical resistance
- can support lubrication of the seal

Application range:

Operating pressure: ≤ 70MPa (700 bar)* Hydraulics
 Operating temperature: - 100°C to + 250 °C **.

* Depending on temperature, profile widths, and gap dimensions.

** Depending on the seal materials used.

Materials:

PTFE compounds in a wide variety of designs such as:

PTFE pure	PT001	PTFE glass	PT002	PTFE 40% bronze	PT052
PTFE carbon	PT033	PTFE carbon/graphite	PT030	PTFE MOS2	PT058

Also available in polyurethane: HPU 94 PU013

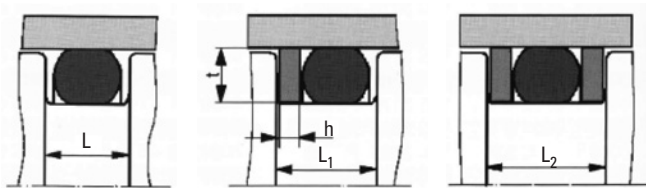
Also available in polyamide: WK001 WK019

Installation instructions:

To avoid damage, the sealing elements must not be pulled over sharp edges or threads. In the case of slotted outlets, the sealing element should be fitted first, followed by the support ring. In the case of a closed design, the support ring should normally be fitted first, followed by the sealing element. The dimensions of the installation spaces are to be carried out according to the table below. To ensure proper functioning, the groove width must be considerably larger than all the support rings and sealing elements fitted before the piston rod or piston is fitted in the cylinder barrel. The elements must therefore not already be laterally clamped before their final assembly.

DIMENSIONS OF THE INSTALLATION SPACES

O-Ring cord (mm)	Support ring h (mm)	Groove depth			Groove width		
		Static	Dyn. Hydr. t (mm)	Dyn. Pneum.	without sup. ring L (mm)	1 sup. ring L ₁ (mm)	2 sup. ring L ₂ (mm)
1,78	1,0 ±0,1	1,30 ±0,05	1,45 ±0,02	1,55 ±0,02	2,4 ^{+0,2} _{-0,0}	3,4 ^{+0,2} _{-0,0}	4,4 ^{+0,2} _{-0,0}
1,78	1,4 ±0,1	1,30 ±0,05	1,45 ±0,02	1,55 ±0,02	2,4 ^{+0,2} _{-0,0}	3,8 ^{+0,2} _{-0,0}	5,2 ^{+0,2} _{-0,0}
2,00	1,0 ±0,1	1,50 ±0,05	1,65 ±0,02	1,75 ±0,02	2,7 ^{+0,2} _{-0,0}	3,7 ^{+0,2} _{-0,0}	4,7 ^{+0,2} _{-0,0}
2,00	1,4 ±0,1	1,50 ±0,05	1,65 ±0,02	1,75 ±0,02	2,7 ^{+0,2} _{-0,0}	4,1 ^{+0,2} _{-0,0}	5,5 ^{+0,2} _{-0,0}
2,40	1,4 ±0,1	1,80 ±0,05	2,05 ±0,02	2,10 ±0,02	3,2 ^{+0,2} _{-0,0}	4,6 ^{+0,2} _{-0,0}	6,0 ^{+0,2} _{-0,0}
2,40	1,5 ±0,1	1,80 ±0,05	2,05 ±0,02	2,10 ±0,02	3,3 ^{+0,2} _{-0,0}	4,7 ^{+0,2} _{-0,0}	6,1 ^{+0,2} _{-0,0}
2,50	1,4 ±0,1	1,90 ±0,05	2,15 ±0,02	2,20 ±0,02	3,3 ^{+0,2} _{-0,0}	4,7 ^{+0,2} _{-0,0}	6,1 ^{+0,2} _{-0,0}
2,50	1,5 ±0,1	1,90 ±0,05	2,15 ±0,02	2,20 ±0,02	3,4 ^{+0,2} _{-0,0}	4,9 ^{+0,2} _{-0,0}	6,4 ^{+0,2} _{-0,0}
2,62	1,4 ±0,1	2,00 ±0,05	2,25 ±0,02	2,35 ±0,02	3,6 ^{+0,2} _{-0,0}	5,0 ^{+0,2} _{-0,0}	6,4 ^{+0,2} _{-0,0}
2,62	1,5 ±0,1	2,00 ±0,05	2,25 ±0,02	2,35 ±0,02	3,6 ^{+0,2} _{-0,0}	5,1 ^{+0,2} _{-0,0}	6,6 ^{+0,2} _{-0,0}
3,00	1,4 ±0,1	2,30 ±0,05	2,60 ±0,02	2,70 ±0,02	4,0 ^{+0,2} _{-0,0}	5,4 ^{+0,2} _{-0,0}	6,8 ^{+0,2} _{-0,0}
3,00	1,5 ±0,1	2,30 ±0,05	2,60 ±0,02	2,70 ±0,02	4,2 ^{+0,2} _{-0,0}	5,7 ^{+0,2} _{-0,0}	7,2 ^{+0,2} _{-0,0}
3,53	1,4 ±0,1	2,70 ±0,07	3,10 ±0,05	3,25 ±0,05	4,8 ^{+0,2} _{-0,0}	6,2 ^{+0,2} _{-0,0}	7,6 ^{+0,2} _{-0,0}
3,53	1,5 ±0,1	2,70 ±0,07	3,10 ±0,05	3,25 ±0,05	4,8 ^{+0,2} _{-0,0}	6,3 ^{+0,2} _{-0,0}	7,8 ^{+0,2} _{-0,0}
4,00	1,4 ±0,1	3,10 ±0,07	3,50 ±0,05	3,65 ±0,05	5,5 ^{+0,2} _{-0,0}	6,9 ^{+0,2} _{-0,0}	8,6 ^{+0,2} _{-0,0}
4,00	1,5 ±0,1	3,10 ±0,07	3,50 ±0,05	3,65 ±0,05	5,4 ^{+0,2} _{-0,0}	6,9 ^{+0,2} _{-0,0}	8,4 ^{+0,2} _{-0,0}
5,00	1,7 ±0,1	4,00 ±0,10	4,40 ±0,05	4,65 ±0,05	6,6 ^{+0,2} _{-0,0}	8,3 ^{+0,2} _{-0,0}	10,0 ^{+0,2} _{-0,0}
5,00	2,0 ±0,1	4,00 ±0,10	4,40 ±0,05	4,65 ±0,05	6,8 ^{+0,2} _{-0,0}	8,8 ^{+0,2} _{-0,0}	10,8 ^{+0,2} _{-0,0}
5,33	1,7 ±0,1	4,30 ±0,10	4,70 ±0,05	4,90 ±0,05	7,1 ^{+0,2} _{-0,0}	8,8 ^{+0,2} _{-0,0}	10,5 ^{+0,2} _{-0,0}
5,33	2,0 ±0,1	4,30 ±0,10	4,70 ±0,05	4,90 ±0,05	7,2 ^{+0,2} _{-0,0}	9,2 ^{+0,2} _{-0,0}	11,2 ^{+0,2} _{-0,0}
5,70	1,7 ±0,1	4,60 ±0,10	5,00 ±0,05	5,30 ±0,05	7,2 ^{+0,2} _{-0,0}	8,9 ^{+0,2} _{-0,0}	10,6 ^{+0,2} _{-0,0}
5,70	2,0 ±0,1	4,60 ±0,10	5,00 ±0,05	5,30 ±0,05	7,7 ^{+0,2} _{-0,0}	9,9 ^{+0,2} _{-0,0}	12,0 ^{+0,2} _{-0,0}
6,00	1,7 ±0,1	4,90 ±0,10	5,30 ±0,05	5,70 ±0,05	7,6 ^{+0,2} _{-0,0}	9,3 ^{+0,2} _{-0,0}	11,0 ^{+0,2} _{-0,0}
6,00	2,0 ±0,1	4,90 ±0,10	5,30 ±0,05	5,70 ±0,05	8,0 ^{+0,2} _{-0,0}	9,6 ^{+0,2} _{-0,0}	11,6 ^{+0,2} _{-0,0}
6,99	2,5 ±0,1	5,80 ±0,10	6,10 ±0,05	6,55 ±0,05	9,5 ^{+0,2} _{-0,0}	12,0 ^{+0,2} _{-0,0}	14,5 ^{+0,2} _{-0,0}
6,99	2,5 ±0,1	5,80 ±0,10	6,10 ±0,05	6,55 ±0,05	9,6 ^{+0,2} _{-0,0}	12,1 ^{+0,2} _{-0,0}	14,6 ^{+0,2} _{-0,0}
8,40	2,5 ±0,1	7,00 ±0,10	7,55 ±0,05	7,90 ±0,05	11,5 ^{+0,2} _{-0,0}	14,6 ^{+0,2} _{-0,0}	17,6 ^{+0,2} _{-0,0}

**Ordering example:**

You want to dynamically seal a 4 mm O-Ring in a 100 mm bore at high hydraulic pressure, and use a concave endless back-up ring for this purpose.

The design is: **STD**

According to the table, the dimensions for the back-up ring are: **100 x 93 x 1.5**
Selected material PTFE pure: **PT001**

The support ring is designated as follows:

STD0093,0x0100,0x01,5PT001

Remark:

Dimensions in the article code always ID x AD and always 4 digits with one decimal place. Thickness: h 2 digits with one decimal place.

In special applications (high temperature, speed, specific pressure load or use in water, HFA, HFB fluids etc.) it is advisable to select thicker back-up rings. Please contact our application engineering department.

7.5 DIMENSIONS O-RINGS

di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
0,75	x	1	3,7	x	1,6	6	x	2,1	8	x	3,5	10	x	6
0,8	x	1,25	3,8	x	1,5	6	x	2,2	8	x	4	10	x	6,5
0,8	x	2	3,9	x	1,8	6	x	2,5	8	x	5	10	x	8
1,07	x	1,21	3,95	x	1,78	6	x	3	8	x	8	10,1	x	1,7
1,07	x	1,27	4	x	1	6	x	3,5	8,2	x	2	10,1	x	1,8
1,1	x	2	4	x	1,2	6	x	4	8,3	x	1,6	10,3	x	2,4
1,2	x	1	4	x	1,5	6	x	4,5	8,3	x	2,4	10,5	x	1,5
1,2	x	2	4	x	1,6	6	x	5,5	8,5	x	1	10,5	x	1,75
1,24	x	2,62	4	x	1,75	6	x	6	8,5	x	1,5	10,5	x	2
1,42	x	1,52	4	x	2	6	x	6,5	8,5	x	2,5	10,5	x	2,3
1,5	x	1	4	x	2,2	6,03	x	1,88	8,5	x	3	10,5	x	2,7
1,5	x	1,5	4	x	2,5	6,07	x	1,3	8,7	x	2	10,5	x	4,5
1,5	x	1,75	4	x	3	6,07	x	1,78	8,73	x	1,78	10,5	x	5,9
1,5	x	1,75	4	x	4	6,16	x	2,67	8,9	x	1,9	10,77	x	2,62
1,5	x	2	4	x	5	6,3	x	2,4	8,9	x	2,6	10,8	x	1,9
1,78	x	1,78	4	x	5,5	6,3	x	2,6	8,92	x	1,83	10,8	x	2,6
1,8	x	1	4,1	x	1,6	6,4	x	1,8	9	x	1	10,8	x	3
1,8	x	1,2	4,1	x	1,7	6,5	x	1,5	9	x	1,5	10,82	x	1,78
2	x	1	4,12	x	1,69	6,5	x	1,6	9	x	1,6	11	x	1
2	x	1,25	4,2	x	1,9	6,5	x	2	9	x	1,85	11	x	1,2
2	x	1,5	4,3	x	2,4	6,5	x	3	9	x	2	11	x	1,3
2	x	2	4,3	x	5	6,5	x	3,2	9	x	2,25	11	x	1,5
2	x	3	4,4	x	1,1	6,5	x	5	9	x	2,5	11	x	1,78
2,2	x	1	4,5	x	1	6,55	x	3,7	9	x	3	11	x	1,8
2,2	x	1,5	4,5	x	1,5	6,75	x	1,78	9	x	3,5	11	x	2
2,3	x	1,3	4,5	x	1,8	6,8	x	1,6	9	x	4	11	x	2,2
2,35	x	1	4,5	x	2	7	x	1,3	9	x	4,5	11	x	2,5
2,4	x	2,8	4,5	x	2,25	7	x	1,5	9	x	5	11	x	2,8
2,5	x	1	4,5	x	2,4	7	x	2	9	x	5,5	11	x	3
2,5	x	1,2	4,6	x	2	7	x	2,2	9	x	6	11	x	3,5
2,5	x	1,3	4,7	x	1	7	x	2,5	9	x	10	11	x	4
2,5	x	1,6	4,75	x	2,62	7	x	3	9,2	x	2,62	11	x	4,2
2,5	x	1,75	4,8	x	1,5	7	x	4	9,2	x	2,65	11	x	4,5
2,57	x	1,78	4,93	x	1,5	7	x	6	9,2	x	3,5	11	x	5
2,6	x	1	4,95	x	1,28	7,1	x	1,6	9,25	x	1,78	11	x	5,2
2,6	x	1,3	5	x	1	7,2	x	1,9	9,3	x	1,6	11	x	5,5
2,6	x	1,4	5	x	1,2	7,3	x	2,4	9,3	x	2,4	11	x	6
2,6	x	2	5	x	1,4	7,5	x	1,5	9,3	x	2,44	11	x	7
2,7	x	1,5	5	x	1,5	7,5	x	1,7	9,5	x	1,5	11	x	9
2,84	x	1,78	5	x	1,75	7,5	x	1,85	9,5	x	1,6	11,11	x	1,59
2,85	x	2,32	5	x	1,9	7,5	x	2	9,5	x	2	11,2	x	2,3
2,9	x	1,78	5	x	2	7,5	x	2,4	9,5	x	2,5	11,3	x	1,3
3	x	1	5	x	2,5	7,5	x	2,5	9,5	x	2,75	11,3	x	2,4
3	x	1,2	5	x	3	7,5	x	5	9,5	x	3	11,4	x	4,4
3	x	1,6	5	x	3,5	7,5	x	6,75	9,5	x	5	11,5	x	1,5
3	x	1,8	5	x	4	7,53	x	3,53	9,52	x	1,78	11,5	x	2
3	x	1,85	5	x	5	7,6	x	1,9	9,52	x	2,5	11,5	x	2,5
3	x	2	5,1	x	1,6	7,6	x	4	9,6	x	4,8	11,5	x	2,8
3	x	2,4	5,28	x	1,78	7,65	x	1,78	9,75	x	1,78	11,5	x	3
3	x	3	5,3	x	1,7	7,8	x	1,75	9,8	x	1,5	11,5	x	4
3	x	4,5	5,3	x	1,8	7,9	x	1,6	10	x	1	11,6	x	1,7
3,2	x	1,6	5,3	x	1,8	7,9	x	2,3	10	x	1,3	11,6	x	2,9
3,2	x	2,5	5,3	x	2,4	7,9	x	4,7	10	x	1,5	11,6	x	6,35
3,3	x	1,5	5,3	x	4,3	7,92	x	2,62	10	x	2	11,7	x	5,8
3,3	x	2,4	5,3	x	5	7,95	x	1,78	10	x	2,2	11,8	x	2,1
3,4	x	1,9	5,37	x	1,78	8	x	1	10	x	2,4	11,8	x	2,3
3,45	x	2,02	5,5	x	1	8	x	1,25	10	x	2,5	11,8	x	2,5
3,5	x	1	5,5	x	1,5	8	x	1,5	10	x	2,6	11,84	x	2,4
3,5	x	1,1	5,5	x	1,8	8	x	1,6	10	x	2,8	11,91	x	2,62
3,5	x	1,5	5,56	x	1,59	8	x	1,7	10	x	3	12	x	1
3,5	x	1,6	5,7	x	1,9	8	x	2	10	x	3,1	12	x	1,5
3,5	x	2	5,8	x	1,5	8	x	2,2	10	x	3,3	12	x	1,7
3,5	x	3	5,8	x	2,6	8	x	2,4	10	x	3,5	12	x	1,9
3,62	x	1,64	6	x	1	8	x	2,5	10	x	4	12	x	2
3,68	x	1,25	6	x	1,5	8	x	2,8	10	x	4,5	12	x	2,5
3,68	x	1,78	6	x	2	8	x	3	10	x	5	12	x	3

7.5 DIMENSIONS O-RINGS

di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
12	x	3,2	14	x	5	16,5	x	2,25	18,77	x	1,78	20,5	x	4
12	x	3,5	14	x	6	16,5	x	2,5	18,8	x	1,85	21	x	1
12	x	4	14	x	8	16,55	x	2,13	18,8	x	3	21	x	1,5
12	x	4,5	14,3	x	1,75	16,6	x	1	19	x	1	21	x	2
12	x	4,6	14,3	x	2,4	16,9	x	2,7	19	x	1,5	21	x	2,4
12	x	5	14,3	x	4	17	x	1	19	x	1,8	21	x	2,5
12	x	5,5	14,5	x	1,5	17	x	1,5	19	x	2	21	x	3
12	x	6	14,5	x	1,65	17	x	2	19	x	2,2	21	x	3,5
12	x	7	14,5	x	2	17	x	2,5	19	x	2,4	21	x	4
12	x	8	14,5	x	3	17	x	3	19	x	2,5	21	x	4,5
12	x	10	14,5	x	5	17	x	3,35	19	x	3	21	x	5
12,1	x	2,1	15	x	1,5	17	x	3,5	19	x	3,2	21	x	6
12,1	x	2,7	15	x	2	17	x	3,8	19	x	3,5	21	x	6,5
12,2	x	1,7	15	x	2,15	17	x	4	19	x	4	21	x	8
12,3	x	2,4	15	x	2,25	17	x	4,5	19	x	5	21	x	8,5
12,37	x	2,62	15	x	2,5	17	x	5	19	x	6	21	x	10
12,4	x	1,78	15	x	2,6	17	x	5,5	19	x	7	21	x	12
12,5	x	2	15	x	3	17	x	7	19	x	9	21,2	x	2,4
12,5	x	2,25	15	x	3,2	17	x	8	19	x	10	21,2	x	2,5
12,5	x	2,5	15	x	3,5	17	x	10	19,05	x	2,62	21,3	x	3,6
12,6	x	3,25	15	x	3,8	17,12	x	2,26	19,2	x	3	21,4	x	4
12,8	x	3,2	15	x	4	17,17	x	1,78	19,4	x	1,3	21,5	x	1
13	x	1	15	x	5	17,3	x	2,4	19,4	x	2,4	21,5	x	1,7
13	x	1,3	15	x	5,6	17,5	x	1,5	19,5	x	1	21,5	x	2,5
13	x	1,5	15	x	6	17,5	x	1,8	19,5	x	1,78	21,5	x	3
13	x	1,7	15	x	7	17,5	x	2	19,5	x	2,5	21,5	x	7,2
13	x	2	15	x	8	17,5	x	3,15	19,5	x	5,3	21,59	x	5,33
13	x	2,15	15	x	9	17,5	x	3,25	19,5	x	6	21,6	x	14,4
13	x	2,5	15	x	10	17,5	x	3,5	19,5	x	8,4	21,8	x	3
13	x	3	15,2	x	2,8	17,5	x	4,2	19,6	x	4	21,8	x	3,53
13	x	3,5	15,24	x	5,33	17,5	x	6,25	19,6	x	6,2	21,95	x	1,78
13	x	3,8	15,3	x	1,78	17,6	x	1	19,8	x	2,3	22	x	1
13	x	4	15,3	x	2,4	17,8	x	2,6	19,8	x	3,6	22	x	1,3
13	x	4,5	15,5	x	1,55	17,8	x	10	19,99	x	5,33	22	x	1,4
13	x	5	15,5	x	3,5	17,86	x	2,62	20	x	1	22	x	1,5
13	x	6	15,5	x	3,8	18	x	1	20	x	1,3	22	x	2
13	x	8	15,5	x	4,2	18	x	1,3	20	x	1,5	22	x	2,5
13,2	x	1,9	15,5	x	4,5	18	x	1,5	20	x	2	22	x	2,62
13,3	x	2,4	15,54	x	2,62	18	x	1,65	20	x	2,2	22	x	3
13,34	x	1,34	15,6	x	1,78	18	x	2	20	x	2,5	22	x	3,5
13,5	x	2,5	15,6	x	2,6	18	x	2,2	20	x	2,8	22	x	4
13,5	x	5	15,6	x	3,4	18	x	2,5	20	x	3	22	x	4,5
13,6	x	2,2	15,8	x	4,1	18	x	2,75	20	x	3,15	22	x	5
13,6	x	2,5	15,9	x	2,3	18	x	3	20	x	3,5	22	x	5,5
13,6	x	2,75	16	x	1	18	x	3,15	20	x	3,6	22	x	6
13,6	x	3	16	x	1,25	18	x	3,5	20	x	4	22	x	6,75
13,65	x	2,62	16	x	1,5	18	x	4	20	x	4,3	22	x	7,5
13,9	x	2,4	16	x	2	18	x	4,5	20	x	4,5	22	x	8
13,94	x	2,62	16	x	2,5	18	x	5	20	x	5	22	x	11,5
14	x	1	16	x	2,7	18	x	5,75	20	x	5,5	22,2	x	2,4
14	x	1,5	16	x	3	18	x	6	20	x	5,7	22,2	x	3
14	x	1,6	16	x	3,5	18	x	6,75	20	x	6	22,23	x	3,5
14	x	1,65	16	x	4	18	x	7	20	x	6,5	22,26	x	6,33
14	x	1,7	16	x	4,25	18	x	7,25	20	x	6,75	22,3	x	2,4
14	x	1,78	16	x	4,4	18	x	8	20	x	7	22,4	x	1,5
14	x	1,8	16	x	4,5	18	x	8,5	20	x	8	22,4	x	3,15
14	x	2	16	x	5	18	x	9,5	20	x	10	22,42	x	1,78
14	x	2,5	16	x	5,5	18	x	11	20,22	x	3,53	22,5	x	2,5
14	x	2,6	16	x	5,6	18,2	x	3,8	20,22	x	4,04	22,5	x	3,25
14	x	2,7	16	x	6	18,3	x	2,4	20,24	x	1,78	22,5	x	3,5
14	x	3	16	x	7	18,3	x	4	20,24	x	2,62	22,5	x	7
14	x	3,2	16	x	8	18,5	x	1,2	20,3	x	2,4	22,6	x	1,8
14	x	3,5	16	x	10	18,5	x	1,5	20,3	x	9,2	22,6	x	3,2
14	x	4	16	x	12	18,5	x	2,5	20,5	x	2	22,67	x	1,78
14	x	4,1	16,1	x	1,6	18,64	x	3,53	20,5	x	2,5	22,7	x	2,6
14	x	4,2	16,5	x	1,5	18,72	x	2,62	20,5	x	3,2	23	x	1

7.5 DIMENSIONS O-RINGS

di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
23	x	1,5	25	x	6,5	28	x	1	30	x	7,5	32,6	x	1,2
23	x	1,75	25	x	7	28	x	1,5	30	x	8	32,7	x	1,3
23	x	2	25	x	7,5	28	x	1,7	30	x	9	32,92	x	3,53
23	x	2,5	25	x	8	28	x	2	30	x	10	32,96	x	3,53
23	x	3	25	x	9	28	x	2,5	30	x	11	32,99	x	2,62
23	x	3,5	25	x	10	28	x	2,62	30	x	12	33	x	1,2
23	x	3,6	25	x	12	28	x	3	30	x	17,5	33	x	1,5
23	x	4	25	x	13	28	x	3,15	30,1	x	2,62	33	x	2,5
23	x	4,5	25	x	15	28	x	3,5	30,3	x	2,4	33	x	3
23	x	5	25,2	x	1,8	28	x	3,65	30,3	x	5,7	33	x	3,5
23	x	5,5	25,2	x	3	28	x	3,7	30,43	x	1,78	33	x	4
23	x	6	25,5	x	1,6	28	x	4	30,5	x	3,65	33	x	5
23	x	7	25,5	x	1,8	28	x	4,3	30,5	x	15	33	x	6
23	x	8	25,5	x	3,7	28	x	5	30,8	x	3,6	33	x	6,5
23	x	9	25,67	x	1,78	28	x	6	30,8	x	3,7	33	x	7
23	x	10	26	x	1	28	x	8	30,81	x	3,78	33	x	8
23	x	11	26	x	1,5	28	x	8,5	31	x	1,5	33	x	9
23,3	x	2,4	26	x	2	28	x	8,75	31	x	2	33	x	12
23,39	x	3,53	26	x	2,1	28	x	10	31	x	2,2	33,05	x	1,75
23,4	x	5,8	26	x	2,5	28	x	13	31	x	2,5	33,05	x	1,78
23,47	x	2,62	26	x	3	28,17	x	3,53	31	x	3	33,3	x	2,4
23,47	x	2,95	26	x	3,5	28,25	x	2,62	31	x	3,5	33,4	x	3
23,5	x	1,78	26	x	3,7	28,3	x	1,8	31	x	4	33,5	x	1
23,5	x	2	26	x	4	28,42	x	2,62	31	x	5	33,5	x	2
23,5	x	3	26	x	5	28,5	x	3,3	31	x	5,5	33,5	x	3,15
23,5	x	3,5	26	x	5,5	28,5	x	7,9	31	x	6	33,5	x	4
23,5	x	5,25	26	x	6	28,85	x	9,53	31	x	8	33,6	x	2,43
23,5	x	8,4	26	x	7	29	x	1,5	31	x	9,5	33,99	x	1
23,6	x	3,15	26	x	8	29	x	1,8	31	x	14	34	x	1
23,81	x	2,62	26	x	8,75	29	x	3	31,3	x	0,8	34	x	1,1
24	x	1	26,2	x	2,3	29	x	3,5	31,35	x	3,53	34	x	1,5
24	x	1,5	26,2	x	3	29	x	5	31,42	x	2,6	34	x	2
24	x	2	26,3	x	2,4	29	x	6	31,47	x	1,78	34	x	2,5
24	x	2,1	26,5	x	3,15	29	x	8	31,5	x	1,5	34	x	3
24	x	2,5	26,5	x	3,5	29	x	16	31,5	x	1,75	34	x	3,5
24	x	3	26,5	x	4	29,1	x	2,55	31,5	x	3	34	x	4
24	x	3,5	26,5	x	8	29,2	x	3	31,5	x	3,15	34	x	5
24	x	4	26,57	x	3,53	29,3	x	3,6	31,5	x	3,5	34	x	5,5
24	x	5	26,64	x	2,62	29,5	x	1,2	31,5	x	3,65	34	x	5,75
24	x	5,5	26,7	x	1,78	29,5	x	1,5	31,5	x	4	34	x	6
24	x	6	26,8	x	3	29,5	x	2,3	31,75	x	3,18	34	x	7
24	x	8	26,8	x	6,6	29,5	x	4,5	31,8	x	1	34	x	7,5
24	x	8,75	27	x	1,3	29,5	x	5	32	x	1	34	x	8
24	x	10	27	x	1,5	29,5	x	5,7	32	x	1,5	34	x	10
24,2	x	2,4	27	x	2	29,5	x	8,5	32	x	1,6	34	x	12
24,2	x	3	27	x	2,5	29,51	x	5,33	32	x	2	34,1	x	3,6
24,5	x	3	27	x	3	29,7	x	1	32	x	2,2	34,2	x	3
24,5	x	3,65	27	x	3,2	29,7	x	3	32	x	2,5	34,5	x	1,7
24,6	x	2,9	27	x	3,5	29,75	x	3,53	32	x	3	34,5	x	3,5
24,6	x	3,4	27	x	4	29,82	x	2,62	32	x	3,2	34,5	x	3,65
24,66	x	1,78	27	x	4,5	29,87	x	1,78	32	x	3,5	34,5	x	3,7
24,8	x	2,2	27	x	5	30	x	1	32	x	4	34,5	x	5,5
24,99	x	3,53	27	x	5,5	30	x	1,5	32	x	4,2	34,52	x	3,53
25	x	1,5	27	x	6	30	x	2	32	x	4,5	34,6	x	1,78
25	x	2	27	x	6,5	30	x	2,4	32	x	5	34,6	x	2,62
25	x	2,5	27	x	7	30	x	2,5	32	x	5,5	34,93	x	6,35
25	x	2,6	27	x	8	30	x	3	32	x	6	35	x	1,5
25	x	3	27	x	12	30	x	3,15	32	x	6,2	35	x	2
25	x	3,2	27,2	x	5,7	30	x	3,5	32	x	8	35	x	2,1
25	x	3,5	27,3	x	2,4	30	x	4	32	x	10	35	x	2,2
25	x	4	27,4	x	3,53	30	x	4,4	32	x	11	35	x	2,5
25	x	4,3	27,5	x	1,1	30	x	4,5	32,1	x	1,6	35	x	2,8
25	x	4,5	27,5	x	1,5	30	x	5	32,2	x	3	35	x	3
25	x	5	27,5	x	2,3	30	x	5,5	32,5	x	2,2	35	x	3,2
25	x	5,7	27,5	x	2,5	30	x	6	32,5	x	2,4	35	x	3,5
25	x	6	27,5	x	6,8	30	x	7	32,5	x	4	35	x	6

7.5 DIMENSIONS O-RINGS

di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
35	x	7	38	x	1,2	40,5	x	2,5	43	x	6	46	x	8
35	x	8	38	x	1,5	40,5	x	3,5	43	x	8	46	x	10
35	x	9	38	x	1,7	40,6	x	2,62	43	x	10	46	x	11
35	x	10	38	x	2	40,6	x	3,2	43	x	20	46	x	22
35	x	15	38	x	2,5	40,64	x	5,33	43,4	x	1,8	46,2	x	3
35,2	x	1	38	x	3	40,87	x	3,53	43,69	x	3	46,4	x	5,4
35,2	x	2,4	38	x	3,5	40,95	x	2,62	43,82	x	5,33	46,5	x	7,2
35,2	x	5	38	x	4	40,99	x	5,33	44	x	2	46,99	x	5,33
35,2	x	5,7	38	x	4,5	41	x	1	44	x	2,5	47	x	2
35,5	x	3	38	x	5	41	x	1,6	44	x	3	47	x	2,13
35,5	x	3	38	x	5,3	41	x	1,75	44	x	4	47	x	2,5
35,5	x	3,15	38	x	6	41	x	1,8	44	x	4,5	47	x	3
35,5	x	4	38	x	6,5	41	x	2	44	x	5	47	x	3,2
35,52	x	2,53	38	x	7	41	x	2,5	44	x	5,5	47	x	3,5
35,6	x	3,6	38	x	8	41	x	3	44	x	6	47	x	3,7
36	x	1,5	38	x	9	41	x	3,5	44	x	6,5	47	x	4
36	x	2	38	x	10	41	x	4	44	x	8	47	x	5
36	x	2,3	38	x	12	41	x	4,5	44	x	11	47	x	5,5
36	x	2,5	38,4	x	2	41	x	5	44,04	x	3,53	47	x	6
36	x	3	38,5	x	3	41	x	7,5	44,1	x	2,6	47	x	9
36	x	3,2	38,5	x	3,5	41	x	8	44,12	x	2,62	47	x	10
36	x	3,5	38,5	x	8,5	41	x	15	44,17	x	1,78	47,2	x	3,5
36	x	4	39	x	1,5	41,2	x	4,7	44,2	x	5,1	47,2	x	5,7
36	x	4,5	39	x	2	41,2	x	5,7	44,2	x	5,7	47,29	x	2,62
36	x	5	39	x	2,5	41,28	x	4,76	44,4	x	4,8	47,35	x	1,78
36	x	5,7	39	x	3	41,5	x	1,5	44,45	x	3,53	47,5	x	1,7
36	x	6	39	x	3,2	41,5	x	3,15	44,5	x	2,4	47,5	x	3,2
36	x	7	39	x	4	41,6	x	1,78	44,5	x	3	47,5	x	4
36	x	8	39	x	5	41,82	x	3,53	44,5	x	3,18	47,5	x	5,75
36	x	9	39	x	5,5	42	x	1	44,5	x	6	47,5	x	6,5
36	x	10	39	x	6,3	42	x	2	44,5	x	6,25	47,6	x	3,53
36	x	11	39	x	6,5	42	x	2,5	44,5	x	8,5	47,7	x	1,5
36	x	16	39	x	10	42	x	2,7	45	x	1	47,7	x	4,75
36,09	x	3,53	39,2	x	3	42	x	3	45	x	1,5	48	x	1
36,14	x	2,62	39,2	x	3,7	42	x	3,5	45	x	2	48	x	1,2
36,2	x	3	39,2	x	5,7	42	x	4	45	x	2,5	48	x	1,7
36,5	x	1	39,2	x	6	42	x	4,5	45	x	3	48	x	2
36,5	x	3,5	39,34	x	2,62	42	x	5	45	x	3,5	48	x	2,5
36,5	x	3,75	39,37	x	2,34	42	x	5,5	45	x	4	48	x	3
36,9	x	5,3	39,4	x	6,6	42	x	6	45	x	4,5	48	x	3,5
37	x	2	39,5	x	1,2	42	x	6,4	45	x	5	48	x	3,65
37	x	2,5	39,5	x	1,5	42	x	7	45	x	5,5	48	x	4
37	x	3	39,6	x	3,7	42	x	8	45	x	6	48	x	4,5
37	x	3,5	39,69	x	3,5	42	x	9	45	x	7	48	x	5
37	x	4	40	x	1	42	x	10	45	x	8	48	x	5,5
37	x	5	40	x	1,5	42	x	11,7	45	x	9	48	x	6
37	x	5,5	40	x	1,6	42	x	13	45	x	10	48	x	6,5
37	x	6	40	x	2	42	x	14	45	x	12	48	x	7
37	x	8	40	x	2,5	42	x	16	45	x	15	48	x	8
37	x	9	40	x	3	42	x	20	45	x	25	48	x	9
37	x	10	40	x	3,15	42,2	x	3	45,2	x	3	48	x	10
37	x	15	40	x	3,5	42,5	x	3,15	45,2	x	5,7	48	x	13
37,1	x	1,6	40	x	4	42,52	x	2,62	45,5	x	1,5	48	x	16
37,2	x	3	40	x	4,5	42,86	x	3,53	45,5	x	5,5	48	x	22
37,2	x	5,7	40	x	5	42,92	x	2,62	45,7	x	2,62	48,32	x	5,33
37,21	x	2,62	40	x	5,5	43	x	1	45,7	x	1,5	48,5	x	1,5
37,3	x	3,6	40	x	6	43	x	1,6	46	x	1,5	48,9	x	2,62
37,47	x	5,33	40	x	7	43	x	2	46	x	2	49	x	1
37,5	x	1,25	40	x	7,5	43	x	2,5	46	x	2,5	49	x	1,5
37,5	x	3,15	40	x	8	43	x	3	46	x	3	49	x	2
37,5	x	8	40	x	10	43	x	3,5	46	x	3,5	49	x	2,5
37,7	x	3,53	40	x	11	43	x	4	46	x	4	49	x	3
37,7	x	5,53	40	x	12	43	x	4,5	46	x	4,5	49	x	3,5
37,77	x	2,6	40	x	13	43	x	5	46	x	5	49	x	4
37,82	x	1,78	40,04	x	2,62	43	x	5,2	46	x	6	49	x	5,5
38	x	1	40,2	x	3	43	x	5,5	46	x	7	49	x	6

7.5 DIMENSIONS O-RINGS

di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
49	x	7	52	x	3,5	55	x	8	59	x	2,5	62	x	4,5
49	x	9	52	x	4	55	x	10	59	x	3	62	x	5
49,2	x	3	52	x	5	55,2	x	3	59	x	2,4	62	x	5,5
49,2	x	5,7	52	x	6	55,35	x	2,62	59	x	3,5	62	x	6
49,21	x	3,53	52	x	6,5	55,56	x	3,53	59	x	4	62	x	6,5
49,4	x	8	52	x	8	56	x	2	59	x	5	62	x	7
49,5	x	2,5	52	x	9	56	x	2,5	59	x	5,5	62	x	10
49,7	x	5,3	52	x	9,5	56	x	3	59	x	7	62	x	11
50	x	1,5	52	x	10	56	x	3,2	59	x	10	62	x	12
50	x	2	52	x	12	56	x	3,5	59,2	x	5,33	62,2	x	5,7
50	x	1,5	52,07	x	2,6	56	x	4	59,2	x	5,7	62,3	x	3,2
50	x	2	52,1	x	1	56	x	4,3	59,3	x	5	62,33	x	1,78
50	x	2,5	52,1	x	6,6	56	x	4,5	59,4	x	2,8	62,5	x	1,3
50	x	3	52,2	x	5,7	56	x	5	59,5	x	5	62,5	x	5
50	x	3,25	52,3	x	1,7	56	x	5,2	59,5	x	6	62,87	x	5,33
50	x	3,5	52,39	x	3,53	56	x	6	59,5	x	6,5	63	x	1,5
50	x	4	52,5	x	3,5	56	x	8	59,69	x	5,33	63	x	2
50	x	4,5	52,9	x	5,33	56	x	10	59,8	x	8,5	63	x	2,5
50	x	5	53	x	1	56	x	12	59,9	x	2,62	63	x	3
50	x	5,33	53	x	1,5	56,5	x	5,33	59,9	x	3,53	63	x	3,2
50	x	5,5	53	x	2	56,5	x	7	59,9	x	5,2	63	x	3,5
50	x	5,7	53	x	2,5	56,5	x	15	60	x	1	63	x	4
50	x	6	53	x	3	56,74	x	3,53	60	x	1,25	63	x	4,5
50	x	6,5	53	x	3,5	56,8	x	6	60	x	1,3	63	x	5
50	x	6,7	53	x	4	56,82	x	2,6	60	x	1,5	63	x	5,5
50	x	7	53	x	4,5	56,87	x	1,78	60	x	2	63	x	6
50	x	8	53	x	5	57	x	1,3	60	x	2,5	63	x	7
50	x	9	53	x	6	57	x	1,5	60	x	2,62	63,09	x	3,53
50	x	10	53	x	7	57	x	2	60	x	3	63,17	x	2,6
50	x	10,5	53	x	10	57	x	2,5	60	x	3,3	63,22	x	1,75
50	x	11	53	x	17	57	x	3	60	x	3,5	63,22	x	1,78
50	x	12	53,34	x	5,33	57	x	3,5	60	x	4	63,5	x	5
50	x	15	53,5	x	1,2	57	x	4	60	x	4,5	63,5	x	5,5
50	x	16	53,57	x	3,53	57	x	4,5	64	x	2	64	x	2,6
50,17	x	1,78	53,6	x	2,6	57	x	5	60	x	5,4	64	x	3
50,2	x	3	53,7	x	1,78	57	x	5,5	60	x	5,7	64	x	3,5
50,25	x	3,6	53,97	x	4,76	57	x	5,7	60	x	6	64	x	4
50,3	x	2,4	53,97	x	5,16	57	x	6	60	x	7	64	x	5
50,39	x	3,53	54	x	1	57	x	6,5	60	x	8	64	x	6
50,47	x	2,6	54	x	2	57	x	7	60	x	9	64	x	8
50,5	x	6,3	54	x	2,5	57	x	8	60	x	10	64,2	x	5
50,5	x	20	54	x	3	57	x	9,5	60	x	11	64,2	x	5,7
50,52	x	1,78	54	x	3,2	57	x	10	60	x	12	64,3	x	1,5
50,8	x	3,55	54	x	3,5	57,1	x	3,53	60	x	13	64,4	x	4
51	x	2	54	x	4	57,2	x	5,7	60	x	15	64,5	x	1,8
51	x	2,5	54	x	4,9	57,3	x	1,5	60	x	18	64,5	x	2,7
51	x	3	54	x	5	57,3	x	5,2	60,04	x	1,78	64,5	x	5,5
51	x	3,2	54	x	5,5	57,5	x	4,3	60,3	x	15	64,77	x	2,62
51	x	3,6	54	x	6	57,5	x	7	61	x	2	64,9	x	6,6
51	x	4	54	x	8	57,75	x	4	61	x	3	65	x	1,5
51	x	4,5	54,2	x	1,65	58	x	1	61	x	3,2	65	x	1,8
51	x	5	54,2	x	3	58	x	2	61	x	3,5	65	x	2
51	x	5,2	54,2	x	5,7	58	x	3	61	x	4	65	x	2,5
51	x	5,5	55	x	1	58	x	3,2	61	x	5	65	x	2,75
51	x	6	55	x	1,2	58	x	3,5	61	x	5,9	65	x	3
51	x	9	55	x	2	58	x	4	61	x	6	65	x	3,5
51	x	10	55	x	2,5	58	x	5	61	x	10	65	x	4
51,2	x	5,7	55	x	3	58	x	5,5	61	x	13	65	x	4,5
51,5	x	1,5	55	x	3,5	58	x	6	61,2	x	5,7	65	x	4,8
51,5	x	10	55	x	3,7	58	x	7	61,6	x	2,62	65	x	5
51,6	x	4,6	55	x	4	58	x	8	61,9	x	6,35	65	x	5,5
52	x	1,5	55	x	5	58	x	10	62	x	1,5	65	x	6
52	x	2	55	x	6	58,42	x	2,62	62	x	2	65	x	7
52	x	2,5	55	x	6,5	58,5	x	3	62	x	2,5	65	x	7,5
52	x	2,8	55	x	7	58,5	x	5,33	62	x	3	65	x	8
52	x	3	55	x	7,5	59	x	2,4	62	x	4	65	x	9

7.5 DIMENSIONS O-RINGS

di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
65	x	10	69	x	7,5	73	x	2	77	x	3	81,2	x	5,7
65	x	10,5	69	x	8	73	x	2,5	77	x	3,5	81,5	x	1,5
65	x	12	69	x	11	73	x	3	77	x	4	81,7	x	7
65	x	13	69,2	x	5,7	73	x	4	77	x	5	81,92	x	5,33
65,09	x	3,53	69,22	x	5,33	73	x	4,5	77	x	10	82	x	3
65,5	x	3,5	69,4	x	2,8	73	x	5	77,2	x	5,7	82	x	3
65,5	x	15	69,4	x	5,2	73,39	x	5,33	77,4	x	6,6	82	x	3
65,6	x	5,3	69,45	x	3,53	74	x	1	78	x	1,5	82	x	2,4
66	x	2	69,5	x	13,5	74	x	1,5	78	x	2	82	x	3,5
66	x	3	69,52	x	2,62	74	x	2	78	x	2,5	82	x	4
66	x	3,5	69,57	x	1,78	74	x	2,5	78	x	3	82	x	5
66	x	3,8	69,9	x	3,17	74	x	3	78	x	3,5	82	x	5,5
66	x	4	70	x	2	74	x	3,15	78	x	4	82	x	6,5
66	x	5	70	x	2,5	74	x	3,3	78	x	4,3	82	x	7
66	x	6	70	x	3	74	x	4	78	x	5	82	x	7,5
66	x	6,5	70	x	3,37	74	x	4,5	78	x	5,5	82	x	8
66	x	7,5	70	x	3,5	74	x	5	78	x	6	82	x	10
66	x	8	70	x	4	74	x	6	78	x	10	82,1	x	3,53
66	x	9,5	70	x	4,5	74	x	7,5	78	x	13	82,2	x	2,62
66,04	x	1,78	70	x	4,6	74	x	8	78,5	x	2,5	82,27	x	1,78
66,04	x	5,34	70	x	5	74	x	10	78,74	x	5,33	82,5	x	4
66,27	x	3,53	70	x	5,5	74	x	14	78,97	x	3,53	82,5	x	5
66,35	x	2,6	70	x	5,7	74,2	x	5,7	79	x	2	82,8	x	5
66,4	x	1,78	70	x	6	74,61	x	3,53	79	x	3	82,87	x	5,33
66,5	x	2,5	70	x	6,5	74,63	x	5,33	79	x	6	83	x	1
66,6	x	5,7	70	x	7	75	x	1,78	79	x	7	83	x	2,5
66,68	x	3,52	70	x	7,5	75	x	2,5	79,2	x	5,7	83	x	3
66,7	x	3,2	70	x	8	75	x	3	79,3	x	5,3	83	x	4,5
66,87	x	3,53	70	x	10	75	x	3,5	79,4	x	4,75	83	x	5
67	x	1,5	70	x	11	75	x	4	79,5	x	3	83	x	5,5
67	x	2	70	x	15	75	x	4,5	79,5	x	7	83	x	9
67	x	2,5	70	x	17,5	75	x	4,9	79,77	x	5,34	84	x	2
67	x	2,7	70	x	20	75	x	5	80	x	1,25	84	x	3
67	x	3	70,2	x	5,7	75	x	5,5	80	x	1,3	84	x	4
67	x	3,55	70,5	x	2,4	75	x	6	80	x	1,5	84	x	5
67	x	4	71	x	2	75	x	7	80	x	1,75	84	x	5,7
67	x	4,3	71	x	3	75	x	7,5	80	x	2	84	x	6
67	x	5	71	x	3,5	75	x	8	80	x	2,5	84	x	8
67	x	5,33	71	x	4	75	x	9	80	x	2,8	85	x	1,5
67	x	6	71	x	8,5	75	x	10	80	x	3	85	x	1,8
67	x	7	71	x	9,5	75	x	16	80	x	3,2	85	x	2
67	x	8	71	x	10	75	x	25	80	x	3,5	85	x	2,5
67,2	x	3	71,16	x	2,62	75,57	x	5,33	80	x	3,8	85	x	3
67,2	x	5,7	71,2	x	5,7	75,7	x	9,5	80	x	4	85	x	3,5
67,94	x	2,62	71,44	x	3,53	75,79	x	3,53	80	x	4,5	85	x	4
68	x	1,7	72	x	1,5	75,87	x	2,62	80	x	4,8	85	x	4,5
68	x	2	72	x	2	75,92	x	1,75	80	x	5	85	x	4,9
68	x	2,5	72	x	2,5	75,92	x	1,78	80	x	5,3	85	x	5
68	x	3	72	x	3	76	x	1,5	80	x	5,5	85	x	5,5
68	x	3,53	72	x	3,5	76	x	2,5	80	x	6	85	x	6
68	x	4	72	x	4	76	x	3	80	x	6,5	85	x	6,5
68	x	4,5	72	x	5	76	x	3,5	80	x	8	85	x	7
68	x	5	72	x	5,5	76	x	4	80	x	10	85	x	8
68	x	5,5	72	x	6,99	76	x	4,22	80	x	12	85	x	10
68	x	6	72	x	7	76	x	4,5	80	x	15	85	x	12
68	x	7	72	x	8	76	x	4,76	80	x	16,5	85	x	14
68	x	10	72	x	9	76	x	5	80,5	x	1,75	85	x	16
68	x	15	72	x	10	76	x	6	80,5	x	5	85,1	x	5,3
68,26	x	5,33	72	x	11	76	x	7,56	80,5	x	7	85,32	x	3,53
69	x	1,5	72	x	12	76	x	8	80,8	x	2,3	85,34	x	1,78
69	x	1,5	72,2	x	5,7	76	x	10	81	x	2	85,5	x	2,5
69	x	3	72,39	x	5,33	76	x	11	81	x	4,5	85,6	x	3,2
69	x	4	72,5	x	3,5	76	x	13	81	x	5	86	x	1,7
69	x	4,5	72,62	x	3,53	76	x	15	81	x	6	86	x	2
69	x	5	72,7	x	2,6	76,2	x	6,8	81	x	7	86	x	2,7
69	x	6	72,75	x	1,78	76,3	x	2,4	81	x	14	86	x	3

7.5 DIMENSIONS O-RINGS

di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
86	x	3,5	90	x	5	95	x	3,5	100	x	6	105	x	10
86	x	4	90	x	5,5	95	x	4	100	x	7	105	x	14
86	x	4,1	90	x	6	95	x	4,5	100	x	7,5	105	x	15
86	x	4,5	90	x	6,3	95	x	5	100	x	8	105,1	x	2
86	x	5	90	x	7	95	x	5,5	100	x	10	105,1	x	4,5
86	x	6	90	x	7,5	95	x	6	100	x	12	105,5	x	2,4
86	x	7	90	x	8	95	x	6,3	100	x	12,5	106	x	2
86	x	7,5	90	x	8,5	95	x	7	100	x	16	106	x	2,5
86	x	8	90	x	10	95	x	7,5	100,5	x	5,33	106	x	2,62
86	x	12	90	x	11	95	x	8	100,97	x	5,33	106	x	3
86,3	x	2,6	90	x	14	95	x	10	101	x	2	106	x	4
86,5	x	3	90	x	15	95	x	14	101	x	3	106	x	4,5
87	x	3,5	90,3	x	4	95	x	15	101	x	4,5	106	x	5
87	x	4	91	x	2	95,25	x	4,76	101	x	6	106	x	5,5
87	x	4,4	91	x	8	96	x	1,7	101	x	7	106	x	6,3
87	x	5	91,2	x	5,7	96	x	2	101,2	x	3,53	106	x	7
87	x	7	91,45	x	5,33	96	x	2,5	101,2	x	5,7	106	x	8
87,1	x	2,4	91,67	x	3,53	96	x	3	101,27	x	2,62	106	x	10
87,2	x	5,7	92	x	1,5	96	x	5	101,32	x	1,78	106	x	12
87,5	x	5	92	x	3	96	x	5,33	101,5	x	3	106,5	x	4,75
87,5	x	5,3	92	x	4	96	x	6	101,5	x	3,53	106,5	x	4,8
87,5	x	6,2	92	x	4,5	96	x	8	101,6	x	3,2	107	x	2,5
88	x	1,5	92	x	5	96,5	x	6,5	101,8	x	3,4	107	x	4
88	x	3	92	x	5,3	97	x	3,5	102	x	2	107	x	4,3
88	x	3,5	92	x	5,5	97	x	3,8	102	x	4	107	x	5
88	x	4	92	x	6	97	x	5	102	x	5	107	x	7
88	x	5	92	x	7,5	97,2	x	5,7	102	x	14	107	x	9
88	x	5,5	92	x	8	97,5	x	1,75	102,5	x	2,4	107	x	14
88	x	5,7	92	x	8,5	97,5	x	4,5	103	x	1,5	107	x	15
88	x	6	92	x	10	97,5	x	5	103	x	2,5	107,32	x	5,33
88	x	7,5	92,2	x	5,7	97,5	x	5,5	103	x	3	107,55	x	3,53
88	x	8	93	x	2,5	97,79	x	5,33	103	x	3,5	107,6	x	3,6
88	x	12	93	x	2,8	97,79	x	6,33	103	x	5	107,62	x	2,62
88	x	15	93	x	3	98	x	2	103	x	6	107,7	x	1,78
88	x	21	93	x	4	98	x	2,5	103	x	10	108	x	3
88,1	x	3,6	93	x	5	98	x	3	103	x	12	108	x	4
88,2	x	5,3	93	x	6	98	x	4	104	x	2,5	108	x	5
88,27	x	5,33	93	x	6,5	98	x	5,5	104	x	3	108	x	6
88,49	x	5,57	93	x	12	98	x	6	104	x	3,5	108	x	8
88,5	x	3,53	93,2	x	9,5	98	x	9	104	x	4	108	x	10
88,57	x	2,62	93,5	x	4,5	98,02	x	1,78	104	x	5	108	x	11
88,62	x	1,78	93,75	x	2	98,02	x	3,53	104	x	6	108,3	x	3,8
88,9	x	2,4	94	x	1	98,5	x	1,5	104	x	8	109	x	2,5
88,9	x	15	94	x	1,5	98,5	x	5,3	104	x	13	109	x	4
89	x	2	94	x	2	99	x	3	104	x	16	109	x	5,5
89	x	2,4	94	x	2,3	99	x	5	104,14	x	5,33	109,2	x	5,7
89	x	4	94	x	2,5	99	x	5,5	104,2	x	5,7	109,5	x	3
89	x	4,5	94	x	3	99	x	6	104,37	x	3,53	109,54	x	5,34
89	x	5	94	x	4	99	x	7	104,5	x	6	110	x	1,5
89	x	7	94	x	5	99	x	8	104,8	x	5,33	110	x	2
89	x	8	94	x	7	99	x	12	105	x	1,5	110	x	2,25
89	x	11	94	x	8	99,1	x	2,4	105	x	2	110	x	3
89	x	12	94	x	9	99,2	x	5,7	105	x	2,5	110	x	3,5
89,1	x	5,8	94	x	10,5	99,4	x	6,3	105	x	3	110	x	4
89,2	x	5,7	94	x	20	99,5	x	3	105	x	3,5	110	x	4,5
89,5	x	2,5	94,2	x	5,7	100	x	1	105	x	4	110	x	5
89,5	x	3	94,5	x	3	100	x	1,5	105	x	4,5	110	x	5,5
89,6	x	3,15	94,62	x	5,33	100	x	2	105	x	5	110	x	6
89,69	x	5,33	94,8	x	3,53	100	x	2,5	105	x	5,5	110	x	6,5
90	x	1	94,92	x	2,62	100	x	3	105	x	5,8	110	x	7
90	x	2	94,97	x	1,75	100	x	3,5	105	x	5,9	110	x	7,5
90	x	2,5	94,97	x	1,78	100	x	4	105	x	6	110	x	8
90	x	3	95	x	1,5	100	x	4,5	105	x	7	110	x	10
90	x	3,5	95	x	2	100	x	5	105	x	7,25	110	x	11
90	x	4	95	x	2,5	100	x	5,5	105	x	7,5	110	x	12
90	x	4,6	95	x	3	100	x	5,8	105	x	9,5	110	x	15

7.5 DIMENSIONS O-RINGS

di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
110	x	20	116	x	3	122	x	5	128	x	10	134	x	6,8
110,3	x	2,4	116	x	4	122	x	6	128	x	13	134,2	x	4
110,49	x	5,33	116	x	6	122	x	8	128	x	15,5	134,2	x	5,7
110,7	x	3,53	116	x	7,5	122	x	18	129	x	4	134,5	x	3
111	x	3	116	x	10	122	x	20	129	x	5,5	134,5	x	5
111	x	5	116	x	14	122,5	x	2	129,2	x	5,7	135	x	2
111	x	6	116,7	x	4,4	123	x	2,5	129,5	x	3	135	x	2,5
111	x	11	116,84	x	5,33	123	x	3,3	129,54	x	5,33	135	x	3
111,8	x	3,53	116,84	x	6,99	123	x	3,5	129,54	x	6,99	135	x	3,5
112	x	1,5	117	x	2,5	123	x	5	129,77	x	3,53	135	x	4
112	x	2,5	117	x	2,75	123	x	6,3	129,8	x	3,53	135	x	5
112	x	3	117	x	3	123	x	12	130	x	1,5	135	x	6
112	x	4	117	x	3,5	123,19	x	5,33	130	x	2	135	x	7,5
112	x	5	117	x	4	123,19	x	6,99	130	x	2,5	135	x	10
112	x	6	117	x	7	123,42	x	3,53	130	x	3	135,7	x	3,53
112	x	6,3	117	x	8	123,8	x	3,2	130	x	3,5	135,89	x	5,33
112	x	8	117,07	x	3,53	123,8	x	5,33	130	x	4	135,89	x	6,99
113	x	2	117,1	x	1,78	124	x	3	130	x	4,2	136	x	3,5
113	x	2,5	118	x	2	124	x	3,2	130	x	4,3	136	x	4
113	x	3,5	118	x	3	124	x	4	130	x	4,5	136	x	4,25
113	x	4	118	x	4	124	x	4,5	130	x	5	136	x	5
113	x	8	118	x	4,5	124	x	5	130	x	5,5	136	x	6
113	x	22	118	x	5	124	x	5,4	130	x	6	136	x	8
113,5	x	6,8	118	x	6	124	x	6	130	x	6,35	136	x	12
113,67	x	5,33	118	x	13	124	x	18	130	x	7,5	136,12	x	3,53
113,67	x	6,99	118,5	x	3	124	x	29	130	x	8	137	x	3
113,8	x	3,53	119	x	3	124,2	x	5,7	130	x	10	137	x	3,5
113,8	x	6,99	119	x	4	124,5	x	3	130	x	10,8	137	x	4
113,97	x	2,62	119	x	6,2	125	x	1,5	130	x	12	137	x	6,5
114	x	1,3	119	x	8	125	x	2	130	x	20	137	x	7
114	x	1,6	119	x	10	125	x	2,5	130,2	x	5,33	137	x	8
114	x	3	119,2	x	5,2	125	x	3	131	x	1,7	137,5	x	2,5
114	x	4	119,2	x	5,7	125	x	3,5	131	x	4	138	x	3
114	x	5	119,5	x	3	125	x	4	131	x	5,3	138	x	3,5
114	x	5,5	120	x	2	125	x	5	131,5	x	4,5	138	x	5
114	x	6	120	x	2,5	125	x	6	132	x	1,5	138	x	5,3
114	x	6,5	120	x	3	125	x	7	132	x	1,7	138	x	6
114	x	7	120	x	3,2	125	x	7,5	132	x	2	138	x	8
114	x	8	120	x	3,5	125	x	8	132	x	3	138	x	19
114	x	10	120	x	4	125	x	8,5	132	x	4	138	x	30
114	x	10,5	120	x	4,5	125	x	10	132	x	5	139	x	4
114	x	12	120	x	5	125	x	12,5	132	x	6	139	x	7
114	x	14	120	x	6	126	x	2,4	132	x	8	139,07	x	5,33
114	x	17	120	x	6,5	126	x	3,5	132,72	x	5,33	139,07	x	6,99
114,02	x	1,78	120	x	8,5	126	x	4	132,72	x	6,99	139,2	x	5,7
114,2	x	5,7	120	x	10	126	x	4,5	132,95	x	3,53	139,2	x	6
114,3	x	4,7	120	x	16	126	x	10	133	x	3,2	139,3	x	3,53
114,3	x	15	120	x	20	126,37	x	5,33	133	x	3,25	139,37	x	2,62
114,4	x	3	120,02	x	6,99	126,37	x	6,99	133	x	3,53	139,7	x	5,33
114,4	x	3,8	120,1	x	5,33	126,67	x	2,62	133	x	4	139,7	x	15
115	x	2	120,25	x	3,53	126,67	x	3,53	133	x	4,4	140	x	1,78
115	x	2,5	120,3	x	3,5	126,72	x	1,78	133	x	4,5	140	x	2
115	x	3	120,32	x	2,62	126,9	x	6,4	133	x	5	140	x	2,5
115	x	3,5	120,34	x	3,53	127	x	4	133	x	10	140	x	3
115	x	3,6	120,37	x	1,78	127	x	5	133	x	12	140	x	3,5
115	x	4	120,5	x	6,8	127	x	8	133	x	13	140	x	3,75
115	x	4,1	120,5	x	12	127,5	x	6,8	133,04	x	2,62	140	x	4
115	x	4,5	121	x	2,5	128	x	2	133,07	x	1,78	140	x	4,3
115	x	5	121,5	x	1,2	128	x	2,5	133,3	x	6,4	140	x	4,5
115	x	5,5	121,5	x	5,7	128	x	3	133,4	x	5,34	140	x	5
115	x	6	122	x	1,25	128	x	4	133,5	x	7	140	x	6
115	x	7	122	x	1,3	128	x	6	133,6	x	2,2	140	x	7
115	x	7,5	122	x	2	128	x	6,6	133,8	x	8,4	140	x	7,5
115	x	8,5	122	x	3	128	x	7,5	134	x	3	140	x	8
115	x	15	122	x	4	128	x	8,5	134	x	4	140	x	12
115	x	20	122	x	4,5	128	x	9	134	x	5	140	x	15

7.5 DIMENSIONS O-RINGS

di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
141	x	7	150	x	3	157	x	10,5	165	x	10	175	x	7
141,5	x	3	150	x	3,5	157	x	20	165	x	14	175	x	8
142	x	3	150	x	4	158	x	4	165	x	16	175	x	25
142	x	4	150	x	4,5	158	x	5	165	x	20	175,5	x	3
142	x	5	150	x	5	158	x	6	165,1	x	3,18	176	x	2,7
142	x	6	150	x	5,4	158	x	8	165,4	x	5,33	176	x	3,6
142	x	7,5	150	x	5,5	158	x	12	166	x	1,78	176	x	6
142	x	10	150	x	6	158,12	x	5,33	166	x	4	176,2	x	7
142,24	x	5,33	150	x	6,35	158,12	x	6,99	166	x	6	176,8	x	3,6
142,24	x	6,99	150	x	7	158,35	x	3,53	166,7	x	6,99	177	x	3,5
142,47	x	3,53	150	x	8	158,42	x	2,62	166,75	x	2	177	x	4
142,5	x	5	150	x	9	158,75	x	6,35	167	x	2,5	177,17	x	5,33
143	x	2	150	x	15	159	x	3	167	x	5	177,17	x	6,99
143	x	4	151,77	x	5,33	159	x	4	168	x	4	177,4	x	3,53
144	x	3	151,77	x	6,99	159	x	8,4	168	x	4,5	177,4	x	5,5
144	x	3,5	152	x	3	159,2	x	5,7	168	x	12	177,47	x	2,62
144	x	4	152	x	3,5	159,2	x	7	168,3	x	5,7	177,8	x	4,7
144	x	5	152	x	5	160	x	2	168,3	x	6,99	177,8	x	4,76
144	x	8	152	x	7	160	x	2,5	168,3	x	15	177,8	x	6,35
144	x	8,4	152	x	7,5	160	x	3	168,5	x	6,25	177,8	x	6,6
144,2	x	5,7	152	x	10	160	x	3,5	168,7	x	8,6	177,9	x	8
144,5	x	3	152	x	12	160	x	4	169	x	2,4	178	x	2
145	x	1,5	152,07	x	2,62	160	x	4,5	169	x	15	178	x	4,5
145	x	2,5	152,2	x	5,5	160	x	5	169,1	x	8,4	178	x	10
145	x	3,5	152,5	x	2,5	160	x	5,25	169,2	x	5,7	178	x	12
145	x	4	152,5	x	7	160	x	6	169,2	x	6,2	179	x	2,5
145	x	4,2	153	x	2	160	x	7,2	170	x	1,78	179	x	3
145	x	5	153	x	4	160	x	7,5	170	x	2	179,2	x	5,7
145	x	6	153	x	4,5	160	x	7,7	170	x	2,5	180	x	1,5
145	x	7	153	x	6	160	x	8	170	x	2,62	180	x	12
145	x	7,5	153	x	10	160	x	9	170	x	3	180	x	3
145	x	8	153,5	x	1,6	160	x	10	170	x	3,5	180	x	3,5
145	x	10	153,5	x	3	160	x	12	170	x	4	180	x	4
145,45	x	6,55	153,5	x	5	160	x	16	170	x	5	180	x	4,5
145,52	x	5,33	153,5	x	6,8	161,9	x	7	170	x	6	180	x	5
145,72	x	2,62	154	x	3	162	x	2,3	170	x	7	180	x	6
146	x	2	154	x	5	162	x	3,15	170	x	7,5	180	x	7,5
146	x	3	154	x	7	162	x	3,53	170	x	8	180	x	8
146	x	4	154,1	x	8,4	162	x	4	170	x	8,5	180	x	9
146	x	5	154,2	x	5,7	162	x	5	170	x	10	180	x	10
146	x	6	155	x	1,7	162	x	6	170,3	x	4,7	180	x	14
146	x	7	155	x	2,5	162	x	8	170,82	x	5,33	181	x	6,35
146	x	8	155	x	3	162	x	11	170,82	x	6,99	181,8	x	2,4
146	x	12	155	x	3,5	163	x	4	171	x	2,5	182	x	3
146,1	x	5,33	155	x	4	163	x	9	171	x	11	182	x	3,5
147	x	1,78	155	x	5	163,6	x	2,2	171,05	x	3,53	182	x	4
147	x	15	155	x	5,7	164	x	3	171,12	x	2,62	182	x	5
148	x	2	155	x	6	164	x	4	171,4	x	3,2	182	x	6
148	x	4	155	x	7,5	164	x	5	172	x	4	182	x	7
148	x	5	155	x	8	164	x	8,4	172	x	6	182	x	8
148	x	5,5	155	x	15	164	x	12	172	x	6,3	183,52	x	5,33
148	x	6	155,5	x	6	164,2	x	5,7	172	x	7	183,52	x	6,99
148	x	8	155,5	x	7	164,46	x	6,99	172,5	x	2,5	183,74	x	3,53
148	x	10	155,6	x	6,99	164,47	x	5,33	173	x	5	183,82	x	2,62
148,5	x	7,5	156	x	2	164,7	x	3,53	173,5	x	5	184	x	3
148,59	x	5,33	156	x	2,5	164,77	x	2,62	174	x	2,5	184	x	3,5
148,59	x	6,99	156	x	3	165	x	2	174	x	3	184	x	6
148,82	x	3,53	156	x	4	165	x	2,5	174	x	3,5	184	x	8
149	x	3	156	x	6	165	x	3	174	x	5,25	184	x	8,4
149	x	5	156	x	10	165	x	3,5	174,2	x	5,7	184	x	15
149,1	x	8,4	156	x	12	165	x	4	175	x	2	184	x	16
149,2	x	3,2	156	x	16	165	x	4,5	175	x	2,5	184,1	x	8,4
149,2	x	5,7	157	x	3	165	x	5	175	x	3	184,15	x	6,35
149,2	x	6,2	157	x	5	165	x	6,5	175	x	4	184,2	x	5,7
150	x	2	157	x	6	165	x	7,5	175	x	5	185	x	2
150	x	2,5	157	x	8,3	165	x	8	175	x	6	185	x	3

7.5 DIMENSIONS O-RINGS

di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
185	x	3,5	195	x	6	205	x	5,5	215	x	10	228	x	4
185	x	4	195	x	7,5	205	x	6	215	x	20	228	x	7
185	x	4,5	195	x	8	205	x	7	215,17	x	2,62	228	x	8
185	x	5	195	x	10	205	x	7,5	215,27	x	2,62	228	x	10
185	x	6	196	x	3,3	205	x	8	215,27	x	6,99	228,2	x	3,53
185	x	7,5	196	x	6	205	x	20	215,49	x	3,53	228,27	x	2,62
185	x	8	196	x	6,55	205,3	x	6	215,67	x	5,33	229	x	4,3
185	x	10	196,2	x	5,33	206	x	3	215,9	x	6,35	229	x	6
185,4	x	5,33	196,22	x	5,33	206	x	4	216	x	2	229	x	12
186	x	3,5	196,22	x	6,99	206	x	6,99	216	x	4	229,1	x	8,4
186	x	4,5	196,44	x	3,53	206	x	10	216	x	6	230	x	2
186	x	7	196,52	x	2,62	206	x	12	217	x	3	230	x	3
186,5	x	8,5	197	x	3	207,5	x	5,5	217	x	3,7	230	x	4
187	x	4	197	x	13	207,5	x	7,5	217	x	4	230	x	5
187,62	x	2,62	198	x	3,8	208	x	3	217	x	5	230	x	5,7
187,74	x	3,53	198	x	4	208	x	3,5	217	x	5,2	230	x	6
188	x	1,5	198	x	5	208	x	4	217	x	6	230	x	8
188	x	2	198	x	6	208	x	4,5	218	x	5,8	230	x	9
188	x	3	198	x	7	208	x	6	218	x	6	230	x	10
188	x	4	198	x	7,5	208	x	7	218	x	12	230	x	20
188	x	6	198	x	8	208	x	8	218,5	x	4,5	232	x	2
188	x	15	198	x	17	208	x	9	219	x	8,4	233	x	2,5
189,1	x	8,4	199,2	x	5,7	208,92	x	5,33	219,3	x	5,7	233	x	3
189,2	x	5,7	198	x	6	209,1	x	8,4	220	x	2	230	x	3,2
189,5	x	4,5	200	x	2	209,14	x	3,53	220	x	3	234	x	3
189,87	x	5,33	200	x	3	209,2	x	5,7	220	x	3,5	234	x	8,4
189,87	x	6,99	200	x	4	209,22	x	2,62	220	x	4	234,22	x	5,33
190	x	2	200	x	4,5	210	x	2	220	x	5	234,3	x	5,7
190	x	2,7	200	x	5	210	x	3	220	x	7	234,3	x	6,99
190	x	3	200	x	6	210	x	3,5	220	x	7,5	234,32	x	5,33
190	x	3,5	200	x	6,3	210	x	4	220	x	8	234,55	x	3,53
190	x	4	200	x	6,5	210	x	5	220	x	10	234,62	x	2,62
190	x	5	200	x	7	210	x	5,15	220	x	14	235	x	3
190	x	5,5	200	x	8	210	x	5,5	221	x	5	235	x	4
190	x	6	200	x	12	210	x	6	221	x	6	235	x	5
190	x	6,3	201	x	6	210	x	6,5	221,5	x	5,7	235	x	6
190	x	7	201	x	9	210	x	7	221,61	x	5,33	235	x	7
190	x	8	201	x	10	210	x	8	221,66	x	6,99	235	x	8
190	x	8,5	202	x	3,5	210	x	10	221,84	x	3,53	235	x	10
190	x	10	202	x	3,6	210	x	11	221,94	x	2,62	235	x	15
190	x	25	202	x	4	210	x	22	222	x	4	236	x	14
190,1	x	3,53	202	x	5,5	212	x	2,5	222	x	5	236,55	x	4,33
190,17	x	2,62	202	x	6	212	x	4	222	x	18	237	x	6
191	x	5,5	202,57	x	5,33	212	x	5	222,94	x	2,62	237	x	7
191,1	x	6	202,57	x	6,99	212	x	6	223	x	7	237	x	7,5
192	x	2	202,6	x	7	212	x	6,3	224	x	3,8	237,5	x	6
192	x	2,5	202,8	x	3,53	212	x	6,5	224	x	6,3	238	x	2
192	x	3	202,87	x	2,62	212	x	7	225	x	2,8	238	x	4
192	x	3,5	203	x	3	212	x	8	225	x	3	238	x	5
192	x	4	203	x	4	212	x	10	225	x	4	238	x	8
192	x	4,5	203	x	6	212	x	12	225	x	4,5	239	x	4
192,22	x	6,99	203	x	6,35	213	x	2,4	225	x	5	239,3	x	5,7
193	x	2	203,2	x	3,2	213	x	2	225	x	6	239,3	x	6,5
193	x	2,62	203,2	x	11	213	x	3	225	x	6,3	239,5	x	7,5
193	x	5	203,5	x	6	213	x	7	225	x	7	240	x	2,5
193	x	6	204	x	3	213	x	8,5	225	x	8	240	x	3
194	x	2	204	x	4	214	x	2	226	x	4	240	x	4
194	x	3	204	x	5	214	x	3	226	x	6	240	x	5
194	x	5	204	x	6	214,3	x	5,7	226	x	8	240	x	5,7
194,2	x	5,7	204	x	13	215	x	3	227	x	3	240	x	6
195	x	2,5	204,2	x	5,7	215	x	4,5	227	x	3,3	240	x	6,5
195	x	3	204,6	x	5,2	215	x	5	225	x	4,5	240	x	8
195	x	3,2	205	x	2	215	x	5,7	227	x	5,33	240	x	12
195	x	3,5	205	x	3	215	x	6	227,9	x	5,33	240,67	x	5,33
195	x	4	205	x	3,6	215	x	7	227,97	x	5,33	240,67	x	6,99
195	x	5	205	x	5	215	x	8	227,97	x	6,99	240,9	x	3,53

7.5 DIMENSIONS O-RINGS

di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
241	x	6,4	260	x	4	278,99	x	3,53	300	x	15	329,57	x	6,99
241	x	3	260	x	5	279	x	8,4	302	x	4,3	329,79	x	3,53
242	x	6	260	x	6	279,3	x	5,7	302	x	5	330	x	4
242	x	7	260	x	6,5	280	x	2,5	304	x	2	330	x	5
242	x	8	260	x	7	280	x	3	304	x	3	330	x	5,7
242	x	8,5	260	x	8	280	x	3,5	304	x	8	330	x	6
243	x	4	260	x	10	280	x	4	304	x	8,4	330	x	6,5
243	x	8,5	262	x	2	280	x	4,5	304,17	x	5,33	330	x	8
243,5	x	6	262	x	4	280	x	5	304,17	x	6,99	330	x	10
244	x	2	262	x	6	280	x	6	304,39	x	3,53	331	x	3
244	x	3	262	x	14	280	x	6,3	304,8	x	3,53	331	x	3,53
244	x	7	262,34	x	3,53	280	x	7	305	x	3	333	x	4
245	x	3	264	x	3	280	x	8	305	x	4	334,7	x	8,6
245	x	5	264	x	4	280	x	9	305	x	5	335	x	4
245	x	6,5	264	x	8,4	280	x	10	307	x	4	335	x	5
245	x	10	264	x	18	281	x	5	307,57	x	3,53	335	x	6
245	x	11	265	x	3	282	x	4	308	x	6	336,55	x	4,33
245	x	12	265	x	4	282	x	5	308	x	8	336,6	x	3,18
245,2	x	5,7	265	x	4,4	284	x	6	308	x	9	338	x	6
246	x	4	265	x	5	284	x	9	308,86	x	5,33	339	x	8,4
247	x	5	265	x	6	285	x	3	310	x	3	340	x	3,5
247	x	6	265	x	6,5	285	x	3,5	310	x	4	340	x	4
247	x	7	265	x	8	285	x	4	310	x	5	340	x	5
247	x	14	265	x	9	285	x	5	310	x	7	340	x	6
247,02	x	5,33	265	x	10	285	x	5,33	310	x	8	340	x	7
247,25	x	3,53	266	x	6	285	x	6	310	x	10	340	x	8,6
248	x	5	266,07	x	5,33	285,1	x	7	310	x	12	340	x	10
249	x	6	266,07	x	6,99	285,75	x	7,94	312	x	6,3	340	x	12
249	x	8,4	266,29	x	3,53	286	x	4	312	x	18	342	x	3,2
249,3	x	5,7	267	x	4,5	286	x	6,2	313	x	4	342	x	8
250	x	3	267,5	x	5,5	288	x	3,53	313	x	10	342,27	x	6,99
250	x	3,5	268	x	4	288	x	5	314	x	12	343	x	10
250	x	4	268	x	7	288	x	6	315	x	2,5	344	x	1,6
250	x	4,5	268	x	8	290	x	2	315	x	4	344	x	2,5
250	x	5	269	x	2,5	290	x	2,5	315	x	4,5	344	x	8,4
250	x	6	270	x	2,5	290	x	3	315	x	5	345	x	2
250	x	7	270	x	3	290	x	5	315	x	5,33	345	x	3,15
250	x	8	270	x	4	290	x	6	315	x	6	345	x	5
250	x	10	270	x	5	290	x	8	315	x	10	345	x	10
250	x	18	270	x	6	290	x	10	315	x	20	346	x	9,5
251	x	3	270	x	7	291	x	3	316	x	4	347	x	9
251	x	7	270	x	10	291,47	x	5,33	316,87	x	6,99	348	x	4
252,8	x	3,6	270,7	x	4,3	291,47	x	6,99	319	x	5,7	348	x	6
253	x	12	271	x	3	291,69	x	5,35	319	x	7	348	x	8
253,36	x	5,33	272	x	4	292	x	4	319	x	8,4	348	x	11
253,37	x	6,99	272,4	x	7	292,1	x	4,76	319,2	x	3,53	349	x	2,5
253,59	x	1,78	272,64	x	3,53	294	x	4	319,5	x	5,7	350	x	2
253,59	x	3,53	273	x	4,5	295	x	6	320	x	2,5	350	x	2,5
254	x	3	274	x	2	295	x	7	320	x	3	350	x	4
254	x	19	274	x	3	295	x	10	320	x	4	350	x	5
255	x	2	274	x	6,5	295	x	20	320	x	5	350	x	6
255	x	3	274	x	8,6	296	x	2,5	320	x	5,5	350	x	6,5
255	x	4	275	x	2,5	297	x	4	320	x	6	350	x	8
255	x	4,2	275	x	3,5	297	x	7	320	x	6,5	350	x	10
255	x	5	275	x	4	297	x	8,8	320	x	7	350	x	12
255	x	7	275	x	5	300	x	2	320	x	8	351	x	7
256	x	2,5	275	x	7,5	300	x	3	320	x	10	354	x	4
256	x	7,2	275,8	x	8	300	x	3,5	322	x	9	354,97	x	5,33
256,5	x	8,5	276	x	2	300	x	4	324	x	4	354,97	x	6,99
257	x	5	276	x	5,34	300	x	5	324	x	5,34	355	x	4
258	x	6	276	x	7	300	x	6	324	x	6	355	x	5
258	x	12	278	x	5	300	x	6,5	325	x	3,52	355	x	6
259,3	x	5,7	278	x	6	300	x	7,5	325	x	5	355	x	12
260	x	2,5	278	x	8	300	x	8	325	x	6	355,19	x	3,53
260	x	3	278,77	x	5,33	300	x	10	328,6	x	8	358	x	6
260	x	3,53	278,77	x	6,99	300	x	12,5	329,57	x	5,33	359	x	8,4

7.5 DIMENSIONS O-RINGS

di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
360	x	4	400	x	5	448	x	10	500	x	6	585	x	5
360	x	5	400	x	7	450	x	3	503	x	5	590	x	5
360	x	7,5	400	x	8	450	x	5	504	x	6	592	x	8
360	x	8	400	x	10	450	x	10	505	x	3	596,27	x	6,99
360	x	10	402	x	4	451	x	7	506,81	x	5,33	596,75	x	5
360	x	15	405	x	20	452	x	12	506,86	x	6,99	598	x	8
360	x	24	405,26	x	3,53	453	x	3,5	508	x	6	600	x	4
363	x	4	405,26	x	5,33	454	x	8	508	x	8	600	x	5
363	x	8	405,26	x	6,99	455	x	5	508	x	10	600	x	8
364	x	3,53	405,3	x	9,5	455	x	22	510	x	4	600	x	10
365	x	4	408	x	12	456,06	x	3,53	510	x	5	600	x	11
366	x	7	408,3	x	9,5	456,06	x	5,33	510	x	6	600	x	4
366,54	x	3,53	410	x	4	456,06	x	6,99	510	x	12	607	x	5
367	x	3,5	410	x	5	457,2	x	7	510	x	16	608	x	10
367	x	5	410	x	6,5	460	x	4	516	x	6	608,08	x	6,99
367,67	x	6,99	410	x	8	460	x	5	516	x	12	608,08	x	9
368	x	2,5	412	x	8	460	x	6	518	x	8	612	x	7
368	x	4	412	x	9	460	x	8	518,5	x	3	612	x	8
368	x	5,33	415	x	5	461	x	5	520	x	5	615	x	4,5
368	x	6	415	x	6	462	x	10	520	x	10	615	x	5
370	x	3	415	x	15	465	x	5	520	x	12	616	x	15,6
370	x	4	416	x	16	465	x	7	520,5	x	15	617,16	x	5
370	x	7	417	x	3,53	465	x	9	525	x	8	619	x	7
370	x	10	417,96	x	6,99	466,72	x	6,35	527	x	8	620	x	5
370	x	12	419	x	14	468	x	3,53	527	x	8	620	x	6
371	x	8	419,3	x	5,7	468,76	x	6,99	530	x	4	620	x	8
371	x	8,5	420	x	2,5	470	x	3,5	530	x	5	621	x	8
373	x	7	420	x	4	470	x	4	530	x	6	622	x	7
374	x	8	420	x	5	470	x	5,7	530	x	10	625	x	6
375	x	5	420	x	10	470	x	6	530	x	12	625	x	10
375	x	10	422	x	6	470	x	7	531	x	8	625	x	19
375	x	11	422,2	x	6,9	470	x	8	532,26	x	6,99	630	x	10
376	x	6	423	x	3,53	470	x	10	532,4	x	9,5	633,48	x	6,99
380	x	3	424	x	5	472	x	8	538	x	12	635	x	7
380	x	4	425	x	4	473	x	6,5	540	x	3	640	x	8
380	x	5	425	x	8	475	x	4	540	x	4	643	x	5
380	x	6	425,45	x	9,53	475	x	5	540	x	5	644	x	11
380	x	8	427	x	5	477	x	8	540	x	6	648	x	6
380	x	10	428	x	4	479	x	4	540	x	8	651,5	x	11,5
380	x	20	429	x	6	479,3	x	5,7	540	x	10	653	x	8
380,37	x	5,33	430	x	4	480	x	4	542	x	7	654	x	6
380,37	x	6,99	430	x	10	480	x	5	544	x	6	655	x	4
380,59	x	5,35	430,66	x	3,53	480	x	6	545	x	8	658	x	6
382	x	8	430,66	x	5,33	480	x	8	547	x	8	658,88	x	6,99
384	x	8,4	430,66	x	6,99	600	x	4	549	x	6	660	x	3
385	x	5	433	x	4	480,41	x	5,33	550	x	5	660	x	10
385	x	10	433	x	4,5	480,46	x	6,99	550	x	8	662	x	8
386	x	6	433,36	x	6,99	482	x	5	550	x	10	665	x	5,7
388	x	6	434	x	5	482	x	5,34	557,61	x	5,33	665	x	6,35
388	x	7	435	x	8	485	x	5	557,66	x	6,99	670	x	5
389	x	8	435	x	12	485	x	8	559,1	x	6,35	670	x	7
390	x	3	436	x	7	487	x	8	560	x	4	670	x	8
390	x	4	438	x	4	489,2	x	5,7	560	x	5	671	x	10
390	x	9	438,1	x	3,5	490	x	5	560	x	6	671	x	15
393	x	7	439,3	x	5,7	490	x	7	569	x	6	680	x	7
393,07	x	6,99	440	x	3	490	x	8	569,27	x	6,99	680	x	12
393,1	x	7	440	x	4	490	x	9	571	x	10	686	x	7
394	x	6	440	x	16	490	x	12	571,5	x	6,35	690	x	5
394	x	8	441	x	8	490	x	12,7	575	x	6	690	x	7
395	x	5	443,3	x	7	492	x	4	578	x	12	690	x	7,5
395	x	10	443,36	x	6,99	492	x	8	579	x	6	690	x	10
396	x	5	444	x	8	494,16	x	6,99	580	x	8	694	x	6
399,3	x	5,7	445	x	5	495	x	3	580	x	10	695	x	6
400	x	2	445	x	7	495	x	14	580	x	12	695	x	8
400	x	3	448	x	4	496	x	10	582,68	x	6,99	695	x	12
400	x	4	448	x	6	498	x	5	585	x	4	697	x	12

7.5 DIMENSIONS O-RINGS






di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S	di mm	x	S
700	x	10	760	x	8	813	x	12	875	x	8	950	x	10
700	x	13	760	x	10	820	x	10	875	x	10	955	x	10
705	x	8	760	x	12	820	x	12	887	x	7	965	x	7
708	x	6	765	x	12	830	x	6	894	x	12	970	x	10
710	x	8	765	x	25,4	830	x	10	894	x	14	970	x	12
710	x	10	767	x	10	835	x	12	895	x	12	980	x	10
710	x	12	770	x	4	836	x	7	900	x	10	980	x	12
712	x	10	770	x	7	838	x	6	902	x	4	992	x	8
714	x	8	770	x	8,2	840	x	4	910	x	10	995	x	7
722	x	8	780	x	12	843	x	7	920	x	10	1000	x	10
730	x	4	785	x	8	843	x	10	920	x	12	1015	x	8
730	x	8,2	790	x	6,5	850	x	7	922	x	7	1020	x	8
730	x	10	790	x	10	850	x	8	925	x	7	1025	x	12
730	x	12	790	x	12	850	x	10	930	x	10	1030	x	13,7
735	x	6	800	x	5	850	x	15	935	x	10	1044	x	8
740	x	5	800	x	6	860	x	8	936,6	x	25,4	1060	x	10
745	x	7	800	x	10	860	x	12	938	x	7	1070	x	12
755	x	5	802	x	15,6	863	x	7	940	x	12	1100	x	12
760	x	5	809	x	5	865	x	9	945	x	7	1125	x	14,8
760	x	6	810	x	7	865	x	12	945	x	10	1185	x	8
760	x	7	810	x	8	870	x	12	950	x	8			

From Di = 1150 mm, O-Rings can be produced endlessly in a special process.






For further approx. 5000 not listed dimensions we have tools available, which however cannot be used for all materials.

In addition, special sizes are also available in round butt vulcanized design.

7.6 STANDARD AND STOCK LIST PRECISION O-RINGS ACCORDING TO ARP (INCH)

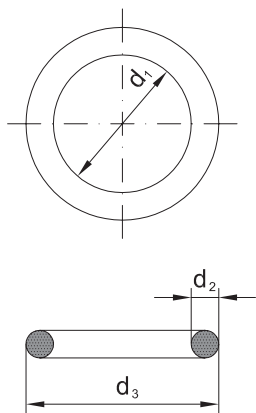
 $d_2 \pm 0,08$			 $d_2 \pm 0,08$			 $d_2 \pm 0,10$			 $d_2 \pm 0,13$			 $d_2 \pm 0,15$		
Order- No.	d_1	d_3	Order- No.	d_1	d_3	Order- No.	d_1	d_3	Order- No.	d_1	d_3	Order- No.	d_1	d_3
001*	0,74	2,78	102	1,24	6,48	201	4,34	11,40	309	10,46	21,12	425	113,67	127,65
002*	1,07	3,61	103	2,06	7,30	202	5,94	13,00	310	12,07	22,73	426	116,84	130,82
003*	1,42	4,46	104	2,84	8,08	203	7,52	14,58	311	13,64	24,30	427	120,02	134,00
004	1,78	5,34	105	3,63	8,87	204	9,12	16,18	312	15,24	25,90	428	123,19	137,17
005	2,57	6,13	106	4,42	6,13	205	10,69	17,15	313	16,81	27,47	429	126,37	140,35
006	2,90	6,46	107	5,23	10,47	206	12,29	19,35	314	18,12	29,08	430	129,54	143,52
007	3,68	7,24	108	6,02	11,26	207	13,87	20,93	315	19,99	30,65	431	132,72	146,70
008	4,47	8,03	109	7,59	12,83	208	15,47	22,53	316	21,59	32,25	432	135,89	149,87
009	5,28	8,84	110	9,19	14,43	209	17,04	24,10	317	23,16	33,82	433	139,07	153,05
010	6,07	9,66	111	10,77	16,01	210	18,64	25,70	318	24,77	35,43	434	142,24	156,22
011	7,65	11,21	112	12,37	17,61	211	20,22	27,28	319	26,34	37,00	435	145,42	159,40
012	9,25	12,81	113	13,94	19,18	212	21,82	28,88	320	27,94	38,60	436	148,59	162,57
013	10,82	14,38	114	15,54	20,78	213	23,39	30,45	321	29,51	40,17	437	151,77	165,75
014	12,42	15,98	115	17,12	22,36	214	24,99	32,05	322	31,12	41,78	438	158,12	172,10
015	14,00	17,56	116	18,72	23,96	215	26,57	33,63	323	32,69	43,35	439	164,47	178,45
016	15,60	19,16	117	20,29	25,53	216	28,17	35,23	324	34,29	44,95	440	170,82	184,80
017	17,17	20,73	118	21,89	27,13	217	29,74	36,80	325	37,47	48,13	441	177,17	191,15
018	18,77	22,33	119	23,47	28,71	218	31,34	38,40	326	40,64	51,30	442	183,52	197,50
019	20,35	23,91	120	25,07	30,31	219	32,92	39,98	327	43,82	54,48	443	189,87	203,85
020	21,95	25,51	121	26,64	31,88	220	34,52	41,58	328	46,99	57,65	444	196,22	210,20
021	23,52	27,08	122	28,24	33,48	221	36,09	43,15	329	50,17	60,83	445	202,57	216,55
022	25,12	28,68	123	29,82	35,06	222	37,69	44,75	330	53,34	64,00	446	215,27	229,25
023	26,70	30,26	124	31,42	36,66	223	40,87	47,93	331	56,52	67,18	447	227,97	241,95
024	28,30	31,86	125	32,99	38,23	224	44,04	51,10	332	59,69	70,35	448	240,67	254,65
025	29,87	33,43	126	34,59	39,83	225	47,22	54,28	333	62,87	73,53	449	253,37	267,35
026	31,47	35,03	127	36,17	41,41	226	50,39	57,45	334	66,04	76,70	450	266,07	289,05
027	33,05	36,61	128	37,77	43,01	227	53,57	60,53	335	69,22	79,88	451	278,77	292,75
028	34,65	38,21	129	39,34	44,58	228	56,74	63,80	336	72,39	83,05	452	291,47	305,45
029	37,82	41,38	130	40,94	46,18	229	59,92	66,98	337	75,57	86,23	453	304,17	318,85
030	41,00	44,56	131	42,52	47,76	230	63,09	70,15	338	78,74	89,40	454	316,87	330,85
031	44,17	47,73	132	44,12	49,36	231	66,27	73,33	339	81,92	92,58	455	329,57	343,55
032	47,35	50,91	133	45,69	50,93	232	69,44	76,50	340	85,09	95,75	456	342,27	356,25
033	50,52	54,08	134	47,29	52,53	233	72,62	79,68	341	88,27	98,93	457	354,97	368,95
034	53,70	57,26	135	48,90	54,14	234	75,79	82,85	342	91,44	102,10	458	367,65	381,65
035	56,87	60,43	136	50,47	55,71	235	78,97	86,03	343	94,62	105,28	459	380,37	394,35
036	60,05	63,61	137	52,07	57,31	236	82,14	89,20	344	97,79	108,45	460	393,07	407,05
037	63,22	66,78	138	53,64	58,88	237	85,32	92,38	345	100,97	111,63	461	405,26	419,24
038	66,40	69,96	139	55,25	60,49	238	88,49	95,55	346	104,14	114,80	462	417,96	431,94
039	69,57	73,13	140	56,82	62,06	239	91,67	98,73	347	107,32	117,98	463	430,66	444,64
040	72,75	76,31	141	58,42	63,66	240	94,84	101,90	348	110,49	121,15	464	443,36	457,34
041	75,92	79,48	142	59,99	65,23	241	98,02	105,08	349	113,67	124,33	465	456,06	470,04
042	82,27	85,83	143	61,60	66,84	242	101,19	108,25	350	116,84	127,50	466	468,76	482,74
043	88,62	92,18	144	63,17	68,41	243	104,37	111,43	351	120,02	130,68	467	481,46	495,44
044	94,97	98,53	145	64,77	70,01	244	107,54	114,60	352	123,19	133,85	468	494,16	508,14
045	101,32	104,88	146	66,34	71,58	245	110,72	117,78	353	126,37	137,03	469	506,86	520,84
046	107,67	111,23	147	67,95	73,19	246	113,89	120,95	354	129,54	140,20	470	532,26	546,24
047	114,02	117,58	148	69,52	74,76	247	117,07	124,13	355	132,72	143,38	471	557,66	571,64
048	120,37	123,93	149	71,12	76,36	248	120,24	127,30	356	135,89	146,55	472	582,68	596,66

7.6 STANDARD AND STOCK LIST PRECISION O-RINGS ACCORDING TO ARP (INCH)

 $d_2 1,78 \pm 0,08$			 $d_2 2,62 \pm 0,08$			 $d_2 3,53 \pm 0,10$			 $d_2 5,33 \pm 0,13$			 $d_2 6,99 \pm 0,15$		
Order- No.	d_1	d_3	Order- No.	d_1	d_3	Order- No.	d_1	d_3	Order- No.	d_1	d_3	Order- No.	d_1	d_3
049	126,72	130,28	150	72,69	77,93	249	123,42	130,48	357	139,07	149,73	473	608,08	622,06
050	133,07	136,63	151	75,87	81,11	250	126,59	133,65	358	142,24	152,90	474	633,48	647,46
			152	82,22	87,46	251	129,77	136,83	359	145,42	156,08	475	658,88	672,86
			153	88,57	93,81	252	132,94	140,00	360	148,59	159,25			
			154	94,92	100,16	253	136,12	143,18	361	151,77	162,43			
			155	101,27	106,51	254	139,29	146,35	362	158,12	168,78			
			156	107,62	112,86	255	142,47	149,53	363	164,47	175,13			
			157	113,97	119,21	256	145,64	152,70	364	170,82	181,48			
			158	120,32	125,56	257	148,82	155,88	365	177,17	187,83			
			159	126,67	131,91	258	151,99	159,05	366	183,52	194,18			
			160	133,02	138,26	259	158,34	165,40	367	189,87	200,53			
			161	139,37	144,61	260	164,69	171,75	368	196,22	206,88			
			162	145,72	150,96	261	171,04	178,10	369	202,57	213,23			
			163	152,07	157,31	262	177,39	184,45	370	208,92	219,58			
			164	158,42	163,66	263	183,74	190,80	371	215,27	225,93			
			165	164,77	170,01	264	190,09	197,15	372	221,62	232,28			
			166	171,12	176,36	265	196,44	203,50	373	227,97	238,63			
			167	177,47	182,71	266	202,79	209,35	374	234,32	244,98			
			168	183,82	189,06	267	209,14	216,20	375	240,67	251,33			
			169	190,17	195,41	268	215,49	222,55	376	247,02	257,68			
			170	196,52	201,76	269	221,84	228,90	377	253,37	264,03			
			171	202,87	208,11	270	228,19	235,25	378	266,07	276,73			
			172	209,22	214,46	271	234,54	241,60	379	278,77	289,43			
			173	215,17	220,81	272	240,89	247,95	380	291,47	302,13			
			174	221,94	227,16	273	247,24	254,30	381	304,17	314,83			
			175	228,27	233,51	274	253,59	260,65	382	329,57	340,23			
			176	234,62	239,86	275	266,29	273,35	383	354,97	365,63			
			177	240,97	246,21	276	278,99	286,05	384	380,37	391,03			
			178	247,32	252,56	277	291,69	298,75	385	405,26	415,92			
						278	304,39	311,45	386	430,66	441,32			
						279	329,79	336,85	387	456,06	466,72			
						280	355,19	362,25	388	481,41	492,07			
						281	380,59	387,65	389	506,81	517,47			
						282	405,26	412,32	390	532,21	542,87			
						283	430,66	437,72	391	557,61	568,27			
						284	456,06	463,12	392	582,68	593,34			
									393	608,08	618,74			
									394	633,48	644,14			
									395	658,88	669,54			

We manufacture special sizes on request.

Metric sizes in approx. 10,000 different dimensions from stock.



O-Rings for UNF fittings

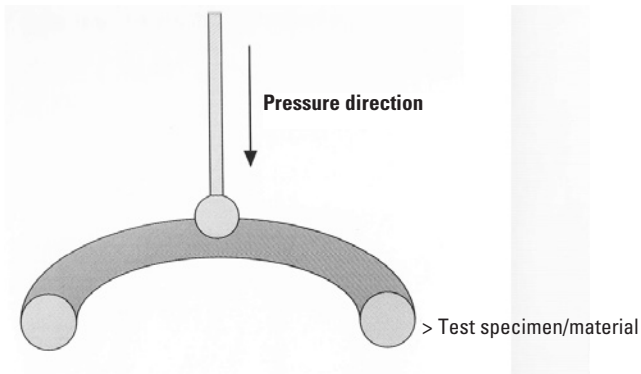
Bestell- Nr.	d_1	d_2
901	4,70	1,42
902	6,07	1,63
903	7,65	1,63
904	8,92	1,83
905	10,52	1,83
906	11,89	1,98
907	13,46	2,08
908	16,36	2,21
909	17,93	2,46
910	19,18	2,46
911	21,92	2,95
912	23,47	2,95
913	25,04	2,95
914	26,59	2,95
916	29,74	2,95
918	34,42	2,95
920	37,47	3,00
924	43,69	3,00
928	53,09	3,00
932	59,36	3,00

8. TERMS FROM SEALING TECHNOLOGY

8.1. HARDNESS

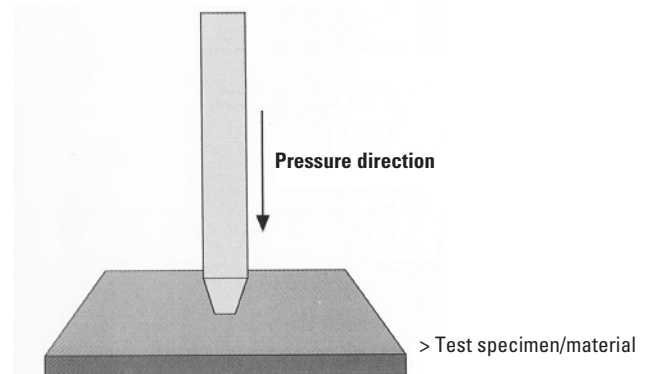
Hardness is the resistance of a body to the penetration of a harder body of a certain shape with a defined force in a certain time. To determine the hardness of elastomers, it is measured according to Shore or IRHD (International Rubber Hardness Degree). Comparable values are determined on standard specimens and given in the unit Shore A. For measurements on the finished part, one usually uses measurement according to IRHD. The

Hardness measurement according to Shore A (DIN 53505) with the indenter (ball)



values determined here differ from those on standard specimens because the part thickness, curved surfaces or values measured at the edge are not comparable and the measurement methods are different. For an O-Ring cord thickness 3 mm up to an O-Ring cord thickness of 1.6 mm, a meaningful hardness measurement is only possible according to IRHD.

Hardness measurement according to IRHD (DIN ISO 48 method CM) with the indentation body (truncated pyramid)



8.2. JOULE EFFECT

If the weight is attached to a free-hanging rubber strip, the strip will be elongated. When this rubber strip is heated, it shrinks and lifts the weight. Unexpectedly cause it to contract and lift the weight. On the other hand, an unloaded rubber strip expands as a function of its coefficient of expansion. This phenomenon is called the Joule effect. If, for example, an O-Ring for a rotating shaft seal is selected with a slightly smaller inner diameter, the rubber strip will expand. A slightly smaller inner diameter, the friction

will cause the O-Ring to heat up. Friction will cause the O-Ring to heat up and its slight stretching will cause it to contract. This then results in a further increase in friction and temperature, which leads to premature failure of the O-Ring due to hardening of the surface.

In this case, therefore, an O-Ring size should be selected which, when installed in the outer part of the groove results in a slight compression of 1-3%.

8.3. LAVE

An abrasion determination such as that according to DIN 53516, roll covered with emery paper, provides only little information for the respective practical application. The actual mechanical wear is much more complex, so that the data that can be determined according to the above standard are of very little informative value. The actual wear of a seal should therefore be determined on an application-specific basis by means of appropriate tests.

In general, it can be said that polyurethane materials are very resistant to abrasion. HNBR, NBR, EPDM, CR and FKM are classified as having the best to good abrasion resistance.

MVQ (silicone) and MFVQ (fluorosilicone) have relatively low abrasion resistance. It is therefore recommended to use these materials only for static applications.

8.4. COEFFICIENT OF EXPANSION

Elastomers have a factor of 10 higher expansion than steel, depending on the composition of the compound. In borderline areas, it is therefore important to know the order of magnitude of this expansion coefficient in order to achieve a sufficiently high preload and thus tightness at low temperatures and shrinkage of the seal.

At high temperatures, the expansion means that care must be taken to avoid excessive groove filling, which would cause the system to leak. The

O-Ring can either be mechanically destroyed by this or the buildup of system pressure before this is no longer sufficient. This can be counteracted by changing the groove design, e.g. the groove width. This thermal expansion is particularly important in the case of high-strength FFKM materials used at temperatures above 200°C. In some cases, up to 30% volume expansion can be achieved by appropriate groove design. In some cases, up to 30% volume expansion must be compensated for by a corresponding groove geometry. In these cases, please consult our application engineering department.

8.5. COMPRESSION SET

The compression set, or DVR for short, is the permanent change in shape of a standard specimen or finished part deformed under certain conditions after it has been relieved of load. The better the DVR, i.e. the lower the remaining percentage deformation of the specimen in relation to the initial state, the higher the quality of the elastomer. The DVR depends on the elastomer type, the compound structure, the exact vulcanization and post-processing. The test temperature, the test duration, the percentage deformation of the specimen thickness, and the test medium are also decisive.

The tests are carried out according to DIN ISO 815 or ASTM D 395 method B, at a compression of 25% (h_1 in the picture). The test is performed under air in a heating furnace according to a specific time specification. A test in oil, steam or other media, shows the values how the contact medium additionally affects the elastomer. This can cause shrinkage or swelling.

This test can also be used to determine the low-temperature flexibility and elastic behavior at low temperatures. Here, the specimens are compressed according to the above test method, frozen step by step and measured in a relaxed state at a specified test temperature.



h_0 = Height of original O-Ring cross-section

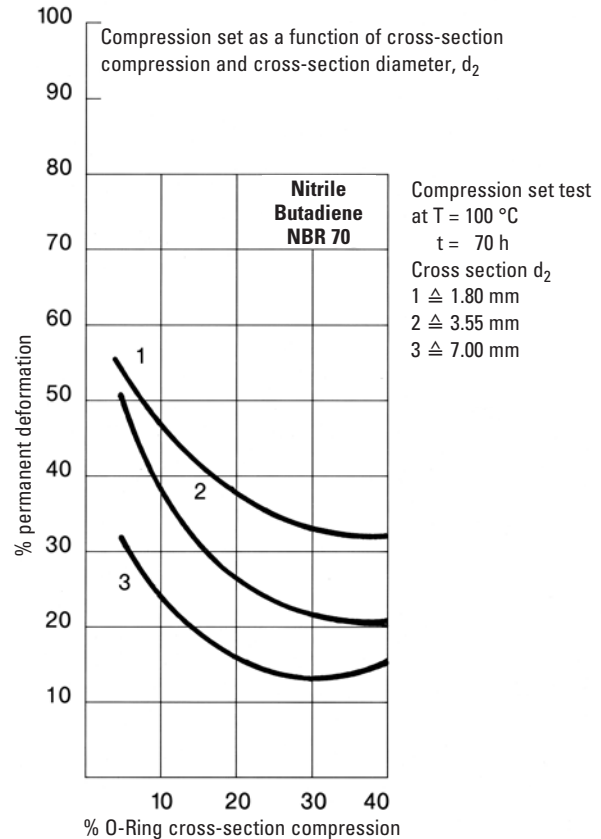
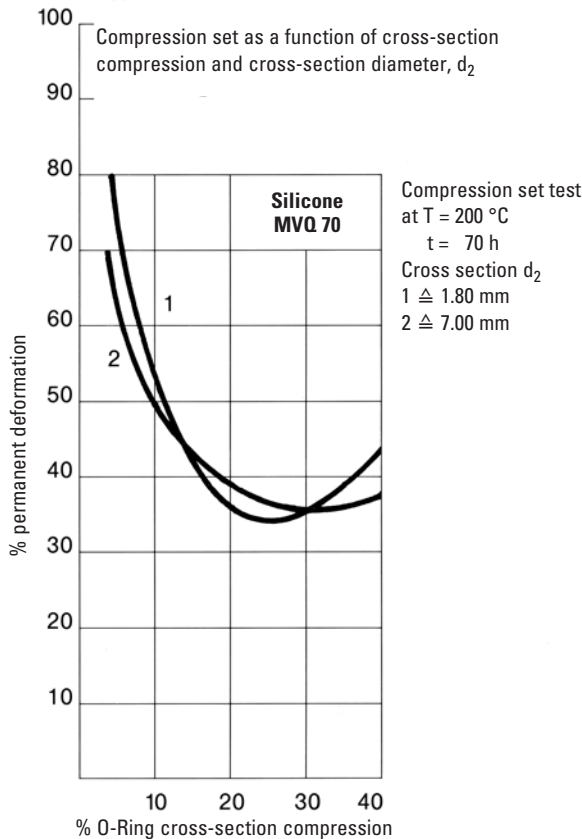
h_1 = Height in compressed state (25%)

h_2 = Height after relaxation after a predetermined duration

The DVR (compression set) is calculated from:

$$\text{DVR} = \frac{h_0 - h_2}{h_0 - h_1} \cdot 100 (\%)$$

Below you can see two diagrams showing the dependence of the test values in relation to the O-Ring cross-section and percentage compression.



8.6. TIGHTNESS, TECHNICAL TIGHTNESS

The tightness of a seal by means of an O-Ring DIN 3771 is described as follows:

– static sealing, i.e. on stationary parts: with liquid media, lossless sealing can be expected, with gaseous media, diffusion losses must be expected.

– dynamic sealing, i.e. on moving parts: in the case of liquid media, leakage loss is usually to be expected due to a film of the medium under the sliding surface after a long period of operation; in the case of gaseous media, loss can also occur at the sliding surface.

8.7. DVI, SEAL COMPATIBILITY INDEX

Elastomers react very differently to contact with different media. This can result in shrinkage or swelling and, in the case of extreme intolerance, complete dissolution of the elastomer.

A change in the volume of the elastomer results in a change in the mechanical properties such as hardness, elongation at break and elasticity, which can lead to complete failure of the seal. These changes can be further reduced by use at high temperatures.

The swelling and shrinkage described above is attributed to the following reactions when the mineral oil comes into contact with the elastomer. On the one hand, the oil diffuses into the rubber, causing it to swell up to its material-specific limit, and on the other hand, the oil dissolves additives from the elastomer, such as plasticizers or antioxidants, causing it to shrink. Both processes can also overlap, resulting in total failure of the elastomer.

These reactions depend not only on the composition of the elastomer, but also on the contact media. An elastomer made of NBR has an acrylonitrile content (ACN) of between 15 and 50%. The higher the ACN content, the better its resistance to mineral oil. Aromatic compounds such as benzene cause greater swelling on the elastomer, while saturated aliphatic kerosenes such as methane cause less swelling. Paraffin-based oils cause minor swelling even at low ACN content. Naphthenic-based oils cause greater swelling. As a result, a higher ACN content is necessary for NBR.

It has been shown that there is a difference between the volume change of various elastomers such as NBR, ACM, FKM and CR and a DVI (seal compatibility index). There is a linear relationship. Thus, the DVI value of an oil can predict a change in volume of these elastomers. The DVI of an oil is determined by testing a test body e.g. of NBR 1 according to ISO 6072,

for 168 hours in an oil at 100°C. From the percentage change in the weight of the test body, relative to its original before and after the test, the DVI of an oil can be determined.

In general, the lower the DVI of an oil, the more compatible it is with elastomers. Below you can see the DVI of various tested oils. Upon customer request, we can also determine the DVI of other oils.

Mineral oil grade	DVI
ASTM-Oil Nr. 1 (new: IRM Oil 901)	2.2- 3.2
BP Energol HLP 100	3.7- 4.7
Esso Nuto H-54 (HLP 36)	5.9- 6.9
Houghton HD 20W/20	6.9- 7.9
Esso Nuto H-44 (HLP 16)	7.1- 8.1
DEA Rando Oil HDC (HLP 36)	7.7- 8.7
Fina Hydran 31	8.5- 9.5
Shell Tellus 923 (HLP 16)	9.2-10.2
ASTM-Oil Nr. 2 (new: IRM Oil 902)	9.4-10.4
Esso-Trafo-Oil 37	12.5-13.5
Agip F.1 Rotra ATF	12.6-13.6
Mobil Vac HLP 16	14.0-15.0
Shell Tellus 15	14.7-15.7
Essovis J 43	15.0-16.0
Shell Oil 4001	16.3-17.3
Texaco Rando Oil AAA	16.5-17.5
BP Energol HP 20	19.0-20.0
ASTM-Oil Nr. 3 (new: IRM Oil 903)	23.0-24.0
Shell Tellus 11	32.9-33.9
Shell Oil JYO	34.5-35.5

8.8. AGE

The aging of elastomers over a certain period of time causes their properties to deteriorate. The nature of the rubber molecules is the cause here. The long chain-shaped macromolecules, as also shown under point 14, can be susceptible to chemical reactions. There are three types of reactions that cause aging:

- Cleavage: the connection of the macromolecular chains are cut off and divided into small segments. UV light, ozone and radioactive radiation cause this cleavage.
- Cross-linking: additional intermolecular bonds are formed by an oxidation process. This process leads to the formation of new molecular chains. These changes take place under the influence of oxygen and heat.

– Modification of molecular secondary groups: chemical reactions cause a change in the molecular structure in your peripheral zone. Contact media interfere with the elastomer and stimulate changes.

The reduction of rubber properties are all caused by the environment. Both under operating conditions and during storage of elastomers. The aging resistance of different elastomers varies greatly.

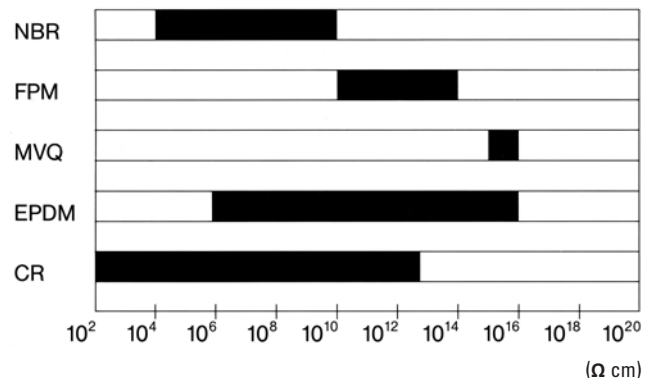
The better the aging resistance of a material, the less the mechanical values such as hardness, tensile strength, elongation at break and the stress value change in a test according to DIN 53508, compared to a new sample.

9. ELECTRICAL PROPERTIES OF ELASTOMERS

Depending on the type of application, elastomers can be good electrical conductors or even good insulators. The determining factors here are the rubber group and the fillers. Materials with a high carbon black content, such as NBR with 90° Shore A, are generally electrically conductive.

- electrically insulating are materials with $> 10^9 \Omega \text{ cm}$ such as EPM, EPDM, VMQ, FKM, SBR and IIR
- electrically insulating are materials with 10^5 bis $10^9 \Omega \text{ cm}$ such as NBR and CR
- electrically conductive are materials with $< 10^5 \Omega \text{ cm}$ special compounds with special fillers

Electrical resistance according to DIN 53596 (standard values)



10. CORROSION

It is not uncommon to have corrosion on metal surfaces in the contact area of the elastomer. This destruction of the metal by chemical influences can be very critical in some applications, such as copper in the fittings industry. Depending on the appearance, pitting, crevice corrosion, intergranular or grain boundary, as well as planar corrosion may be present. Causes can be:

a. free sulfur in conventional elastomer grades as in EPDM

Some rubber grades are vulcanized with elemental sulfur in combination with accelerators. Most of the sulfur thus forms a stable crosslinking bridge between the rubber molecules. However, some of the sulfur always remains as unbound, free sulfur. This then causes corrosion at the contact surfaces of the metal alloys, as in the case of copper, for example, as a result of a chemical reaction. It is therefore advisable to use sulfur-free elastomers wherever possible for applications in which such corrosion can lead to malfunctions.

b. in the case of elastomers containing chlorine due to the formation of hydrochloric acid, as in the case of CR

Elastomers with a chlorine content, such as CR, ECO, CO or in some cases ACM, can in practice release hydrochloric acid due to environ-

mental influences or high temperatures. This also leads to corrosion on the contact surfaces the contact surfaces to the metal components. However, this can be counteracted by suitable stabilizers, such as metal oxides, in a correctly formulated rubber compound.

If a flame retardant such as chlorinated kerosene is used in an elastomer type that is normally chlorine-free, such as SBR or NR, hydrochloric acid can also be split off.

c. Electrochemical processes

The contact of two metals of different nobility in a current-conducting liquid (electrolyte) causes an electrochemical process. It is difficult to say whether the contact partner rubber can also cause such electrochemical corrosion. However, it is assumed that condensation forms between the elastomer and the metal and, in conjunction with other deposits, electrochemical corrosion is triggered. The type of metal alloy, metal structure and surface roughness play a decisive role. The ambient temperature and air humidity should also not be forgotten.

11. THERMAL PROPERTIES

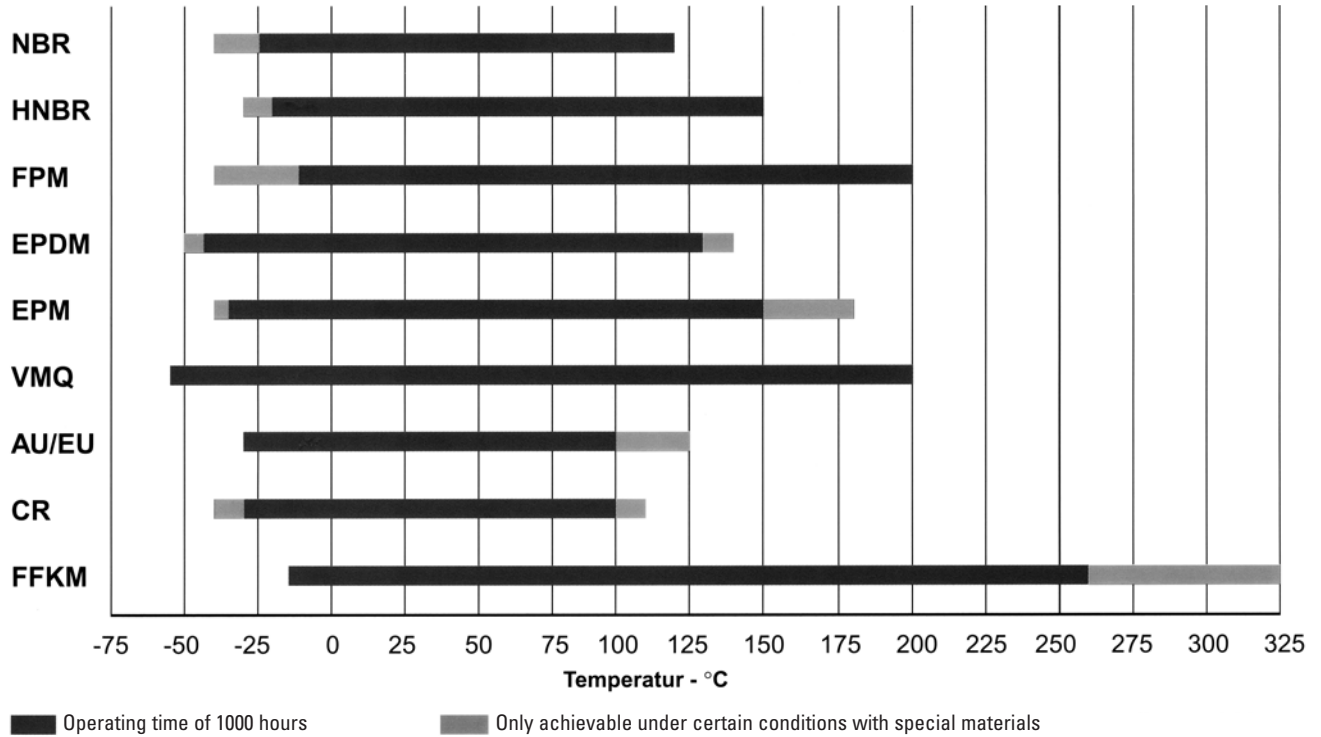
Elastomers can be used over a wide temperature range. Depending on the type of rubber, they exhibit optimum properties and a long service life within their respective temperature limits.

If the temperature falls below a certain limit for which an elastomer is intended, it loses its elasticity and mechanical strength. This is referred to as a glass transition temperature. After subsequent heating, the elastomer usually regains its original properties, i.e. this process is reversible.

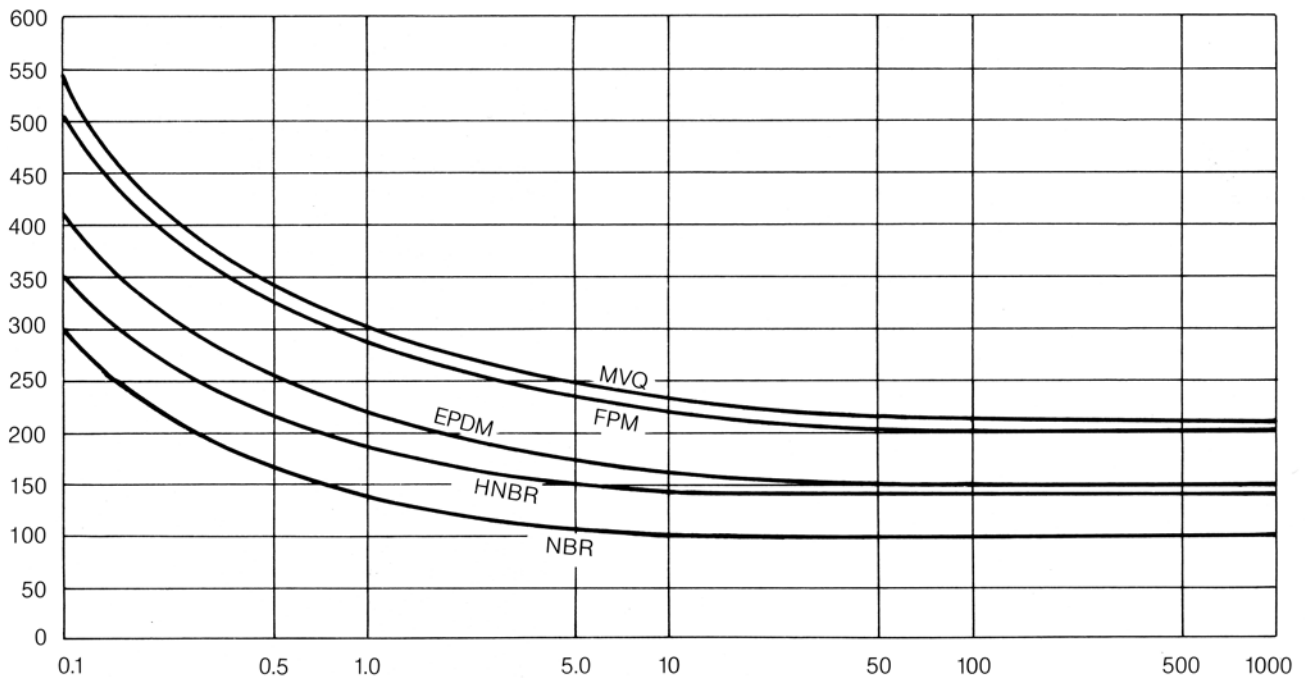
If the temperature limit specified for the elastomer is permanently exceeded, its macromolecular structure is destroyed. After subsequent cooling, the original properties of the elastomer cannot be restored. This process is therefore not reversible. The permissible temperature limit is always determined by the medium acting on the elastomer. A decision must be made as to whether the temperature is to be used for a short period or permanently. For example, the resistance of an elastomer at 100°C in air is not the same as 100°C in mineral oil, or vice versa.

THERMAL PROPERTIES

The following table shows which temperature ranges apply to various elastomers in air. This roughly describes their temperature limits.



The following table shows the service life as a function of the operating temperature



Operating time in hours h

The actual service life of an elastomer at an excessive operating temperature depends on the type of application and the contact media, which is why this table can only be used as a guide.

12. SHAPE AND SURFACE DEVIATIONS ACCORDING TO DIN ISO 3601-3 (old din 3771 part 4)

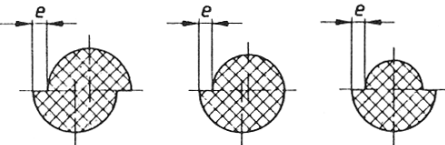
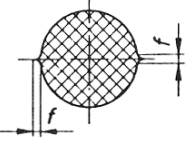
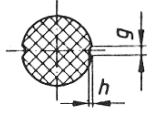
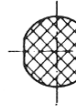
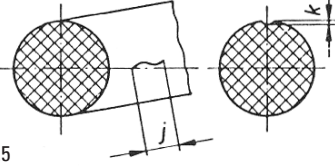
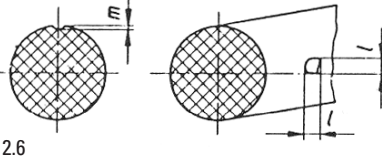
The DIN ISO 3601-3 standard defines the permissible form and surface of O-Rings.

Permissible defect sizes are differentiated according to grade characteristics. The **grade characteristic N** meets the high requirements of industrial applications and applies to both static and dynamic use. The permissible defects do not impair the function of the O-Ring.

Grade S is for special applications, e.g. in aviation. Here, even tighter limits are required for defect sizes. However, this requires considerable effort in production and post-control, which makes these O-Rings much more expensive.

As standard, we supply O-Rings according to grade characteristic N. If O-Rings according to grade S are required, these must be requested separately, stating the application.

Limits for permissible form and surface deviations

Types The deviation	schematic representation	Di- men- sion	Variety characteristic N					Variety characteristic S				
			d ₂ according to DIN ISO 3601-3					d ₂ according to DIN ISO 3601-3				
			1.8	2.65	3.55	5.3	7	1.8	2.65	3.55	5.3	7
largest measure												
Offset and shape deviations	 Image 12.1	e	0.08	0.10	0.13	0.15	0.15	0.08	0.08	0.10	0.12	0.13
Bead, ridge, offset, combined	 Image 12.2	f	0.10	0.12	0.14	0.16	0.18	0.10	0.10	0.13	0.15	0.15
Notch	 Image 12.3	g	0.18	0.27	0.36	0.53	0.70	0.10	0.15	0.20	0.20	0.30
		h	0.08	0.08	0.10	0.10	0.13	0.08	0.08	0.10	0.10	0.13
Deburring area	 Image 12.4	—	Deviations from the round cross-section are permissible, if the flattening merges smoothly into the rounding and d ₂ is maintained.									
Flow lines (radial expansion is not allowed)	 Image 12.5	j	0.05 × d ₁ oder ¹⁾					0.03 × d ₁ oder ¹⁾				
		k	1.5 1.5 6.5 6.5 6.5					1.5 1.5 1 5 5				
Recesses Feeding points	 Image 12.6	l	0.60	0.80	1.00	1.30	1.70	0.15	0.25	0.40	0.63	1.00
		Depth m	0.08	0.08	0.10	0.10	0.13	0.08	0.08	0.10	0.10	0.13
Foreign body	—	—	Not allowed									

¹⁾ Depending on which amount is greater.

In applications where highest precision is required, CS grade characteristics can be used. Please contact our application engineering department for more information.

13. MANUFACTURING PROCESS

Basically, two manufacturing processes are used to produce elastomer O-Rings:

– **The compression molding process, also known as the CM process.** In this process, an elastomer blank is manually inserted between the halves of a vulcanization mold. Its weight or size is determined by the volume of the part to be produced. Now the two mold halves (upper and lower part) are closed under high pressure and thus the blank in between is pressed. The blank is then vulcanized by the heated, closed mold. This manufacturing process is only suitable for small and medium series, or for the production of large parts, as it is very time-consuming.

– **The injection molding process (also called IM process)** In this process, the material is automatically injected under high pressure through flow channels into a closed, heated mold. After a certain heating period during which the injected material vulcanizes, the mold is opened and the raw finished part is removed. In this process, it is preferable to use several nests in a mold in order to obtain a higher to

achieve a higher ejection rate. This process is therefore suitable for larger quantities, but the molds are much more expensive to produce.

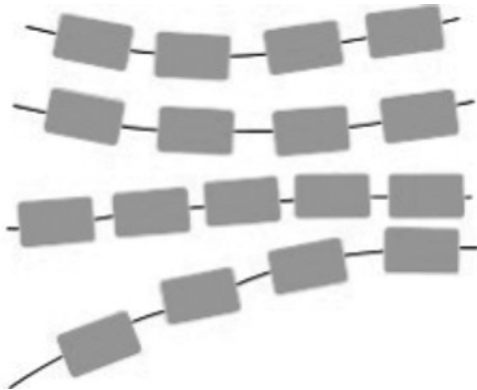
– **The two-component injection molding process (Liquid Silicone Rubber) LSR** This is also a process in which a silicone material (MVQ) is injected into a closed mold. However, two separate media are used here, which only enter into a chemical reaction when mixed in the mold and thus become a solid silicone elastomer. A wide range of soft, low-shore elastomers, available in almost any color, can be produced here. Likewise, a wide range of food-safe materials is available here.

– **Prototype production** Here, elastomer O-Rings can be produced from blanks by means of special production machines and cutting tools. However, the inner diameter and the shear thickness must have a suitable ratio to each other. This manufacturing process is also suitable for small and medium quantities or when delivery is required quickly and no suitable alternative is available from stock. The materials have a hardness of 80 to 95 Shore A.

14. ELASTOMERIC MATERIALS

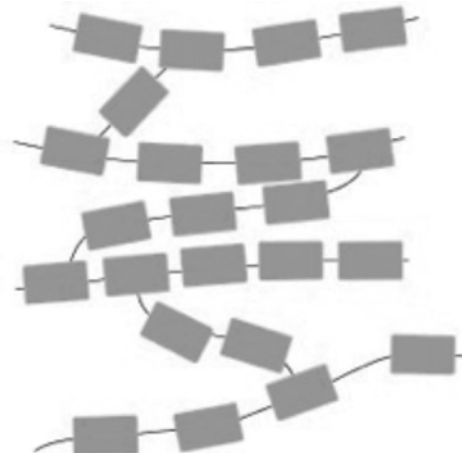
The uncrosslinked raw product of rubber materials or elastomers is rubber. This can be obtained from plantations as natural rubber or produced in chemical factories as synthetic rubber. There are currently more than 30 types of synthetic rubber.

chain macromolecules of rubber (uncrosslinked)



Crosslinking of the macromolecules is achieved by vulcanization. This creates chemical cross-links between the polymer chains. The elastomer now produced has the property of returning to its original shape after a forced change in form.

cross-linked macromolecules of rubber (elastomer)



Technical rubber materials consist of 50-60% rubber by weight. The rest is a formulation of fillers, vulcanizing agents, accelerators, aging agents and other additives. The polymer itself is the weakest link here compared to the media to be sealed. Therefore, the choice of the base polymer is almost always decisive for the selection of the right sealing material. In conjunction with the above-mentioned receptors, the suitable compound is then vulcanized.

15. SPECIFICATION OF THE KAUTSCHUKE ACCORDING TO DIN ISO 1629 AND ASTM D 1418

With regard to the many types of synthetic rubber, it has been agreed to designate them according to the above standards. For this purpose the

solid rubbers have been divided into the following groups on the basis of their chemical composition.

Overview of the most important types of rubber with Westring Short designation of the material no.

Group	Chemical name	DIN ISO 1629	ASTM D 1418	Short name Westring
M	Polyacrylate rubber	ACM	ACM	A....
M	Chloropolyethylene rubber	CM	C....	CM....
M	Ethylene acrylate rubber	AEM	AEM	AE....
M	Chlorosulfonated polyethylene rubber	CSM	CSM	CS....
M	Ethylene propylene rubber	EPM	EPM	E...
M	Ethylene-propylene (diene) rubber	EPDM	EPDM	EP....
M	Fluorine rubber	FKM	FKM	VI....
		FEPM	FEPM	V....
M	Perfluoro rubber	FFKM	FFKM	VO...
				FF....
O	Epichlorohydrin rubber	CO	CO	CO....
O	Epichlorohydrin copolymer rubber	ECO	ECO	EC....
O	Propylene oxide copolymer rubber	GPO	GPO	PC....
R	Butadiene rubber	BR	BR	BT....
R	Chloroprene rubber	CR	CR	C....
R	Isobutene isopropene butyl rubber	IIR	IIR	B....
R	Isoprene rubber	IR	IR	IR....
R	Acrylic butadiene rubber	NBR	NBR	N....
				NB
R	Hydrogenated acrylic butadiene rubber	HNBR	HNBR	NH...
R	Natural rubber	NR	NR	NK...
R	Styrene-butadiene rubber	SBR	SBR	SB....
Q	Fluoro-vinyl-methyl-silicone rubber	FVMQ	FVMQ	FL....
Q	Phenyl methyl silicone rubber	PMQ	PMQ	PM....
Q	Phenyl vinyl methyl silicone rubber	PVMQ	PVMQ	PV....
Q	Vinyl methyl rubber	VMQ	VMQ	SI....
Q	Methyl silicone rubber	MQ	MQ	MS....
U	Polyester urethane rubber	AU	AU	PU....
U	Polyetherurethane rubber	EU	EU	EU...

16. SEALING MATERIALS O-RINGS

In line with their versatile use, there is a wide range of materials for O-Rings made of proven synthetic rubbers in hardnesses from 40 to 94 Shore A. The right choice of the following materials gives O-Rings a very wide range of applications.

The formulation of the individual rubbers can be adjusted according to customer so that specific properties, such as hardness, compression set, abrasion resistance, swelling behaviour and heat can be influenced.

Standard material compounds for O-Rings

Polymer base	Hardness Shore „A“	Area of use	Temperature range in °C
Nitrile (Buna N)	70	Mineral oils, hydraulic fluids, gasolines, Compressed air, SAE 120 R, Class 1, (UL).	-30° bis 110°
Nitrile (Buna N)	90	Mineral oils, hydraulic fluids, compressed air, high resistance to squeezing out; for static seals	-25° bis 110°
Etylen Propylen	70	Steam, hot water, compressed air and diluted acids, Pydraul, Cellulube and similar hydraulic fluids of low flammability. For steam. Brake fluids DOT4	-55° bis 150° bis +180°C
Silikon	70	General use for static applications only, standard dimensional tolerances, air and gases, for static sealing only, AMS 3304 D.	-55° bis 230°
Viton	80	For high temperatures. Oils, aromat. Solvents and chemicals. MIL-R-25897 CL 1.	-25° bis 210°

16.1. MATERIAL OVERVIEW AND PROPERTIES

Acrylonitrile butadiene rubber (NBR, Perbunan®)

Temperature resistance -25°C to +110°C, special compounds -40°C to -120°C. NBR synthetic rubber is primarily resistant to the effects of:

- Aliphatic hydrocarbons (mineral oil, hydraulic oils, greases, diesel fuel, heating oil, propane, butane), special compounds are required for biodiesel.
- HFA, HFB and HFC liquids
- Vegetable and animal fats
- Water (special mixture up to 100°C)
- Many dilute acids, bases and salt solutions at low temperatures

Not resistant to:

- Glycol-based brake fluid
- Ozone, weathering and aging
- Fuels with high aromatic content (super fuel special mixture)
- Aromatic hydrocarbons (benzene)
- Chlorinated hydrocarbons (trichloroethylene)
- Polar solvents (acetone, ketone, ethyl acetate)

Hydrogenated Nitrile Butadiene Rubber (HNBR)

Temperature range -25°C to +150°C, special compounds -40°C. HNBR-rubber has primarily a very high abrasion resistance, good ozone resistance and is resistant to:

- Aliphatic hydrocarbons
- Vegetable and animal fats and oils
- HFA, HFB, HFC liquids
- Water and steam up to 150°C
- Many dilute acids, bases and salt solutions at low temperatures

Not resistant to:

- Glycol-based brake fluid
- Aromatic hydrocarbons (benzene)
- Chlorinated hydrocarbons (trichloroethylene)
- Polar solvents (acetone, ketone, ethyl acetate)

Polyacrylate rubber (ACM)

Temperature resistance -20°C to +150°C, special compounds up to +175°C. ACM acrylate rubber has primarily good high-temperature properties with:

- Engine oils with modern additives up to 150°C, short term up to 175°C.
- High oxidation and ozone resistance
- Gear and ATF oils

Not resistant to:

- Glycol-based brake fluid
- Hot water, steam
- Aromatic and chlorinated hydrocarbons
- acids, alkalis, amine esters)

Butyl rubber (IIR)

Temperature range -40°C to +130°C. Butyl rubber has primarily low gas permeability and good electrical insulation properties. Good resistances are given against:

- glycol-based brake fluid
- many acids, salt solutions and bases
- Hot water steam up to 130°C
- Polar solutions such as alcohol, ketones and esters
- Glycol-based hydraulic fluids, HFC, HFD-R fluids

Not resistant to:

- Mineral oils and greases
- Fuels
- Chlorinated hydrocarbons

Ethylene-propylene-diene rubber (EPDM, EPM)

Temperature range -50°C to +150°C, peroxide crosslinked compounds (EPM) up to +180°C Ethylene-propylene-diene rubber is particularly characterized by good aging and ozone resistance and is well suited for use in:

- Hot water and superheated steam up to 150°C, special compounds up to 180°C.
- glycol-based brake fluids up to 150°C
- many organic and inorganic acids
- caustic soda and potash solutions, detergents
- silicone greases and oils
- ozone

Not resistant to:

- Mineral oil based oils and greases, fuels.

MATERIAL OVERVIEW AND PROPERTIES

Chloroprene rubber / Neoprene (CR)

Temperature range -40°C to +100°C, special compounds up to +120°C. One of the first synthetic rubbers with similar properties to NBR. Lower mineral oil resistance better ozone and aging resistance. Can be used in:

- Water and aqueous solutions at moderate temperatures.
- refrigerants such as ammonia, carbon dioxide and freon
- paraffinic mineral oils with low DVI

Conditionally resistant to:

- ASTM oils No.2 and No.3
- glycol based brake fluids
- propane, butane, gasoline

Not resistant to:

- Aromatic hydrocarbons (benzene)
- Chlorinated hydrocarbons (benzene)
- Polar solvents (ketones, esters, acetone, ether)

Chlorosulfonyl polyethylene rubber (CSM)

Temperature resistance -30°C to 130°C. Excellent material when exposed to ozone good mechanical and physical properties. It is resistant to:

- many acids and bases
- many oxidizing media
- silicone oils and greases
- water and aqueous solutions
- Ozone and weathering resistant

Conditionally resistant to:

- Propane, butane, gasoline, low molecular weight aliphatic hydrocarbons.
- mineral oils and greases (moderate swelling in aliphatic oils IRM901)
- naphthenic and aromatic oils (IRM902 and IRM903 high swelling)

Not resistant to:

- Benzene, aromatic hydrocarbons
- trichloroethylene „tri“, chlorinated hydrocarbons

Silicone rubber (VMQ)

Temperature range -55°C to +200°C, special compounds -65°C to +230°C. Silicone rubber is characterized by a wide temperature range, with similar oil resistance to NBR and limited mechanical properties. Can be used in:

- Water up to approx. 100°C
- Hot air up to 230°C
- Glycol-based brake fluid
- engine and gear oils of aliphatic type, e.g. ASTM-OI No.1
- diluted salt solutions
- flame retardant hydraulic fluids HFD-R and HFD-S
- high molecular weight chlorinated aromatic hydrocarbons such as Clophen, chloridiphenyl
- resistant to ozone, ageing and weathering

Not resistant to:

- Water vapor above 120°C
- silicone greases and oils
- fuels
- aromatic hydrocarbons such as toluene, benzene
- acids and alkalis
- aromatic mineral oils

Fluorosilicone rubber (FVMQ)

Temperature resistance -60°C to +200°C. Improved resistance to fuels and mineral oils compared to MVQ, with slightly poorer hot air resistance and same mechanical properties. Can be used in:

- all media as for silicone (MVQ).

Additionally in:

- fuels
- aromatic mineral oils such as ASTM Oil No.3
- chlorinated solvents
- low molecular weight aromatic hydrocarbons such as benzene and toluene

Liquid silicone (LSR)

Temperature resistance -55°C to +200°C, special compounds up to +230°C Largely the same properties as silicone (MVQ). However, due to the two-component technology, softer materials and various colors can be realized during processing.

materials and various colors can be realized. The group of silicone elastomers has relatively poor tensile strength, tear resistance and abrasion resistance, which is why this group of materials is only recommended for sealing in static applications.

MATERIAL OVERVIEW AND PROPERTIES

Fluorocarbon rubber (FKM, FPM, Viton®)

Temperature resistance -20°C to +210°C, special compound -40°C static. Fluoro rubber has become one of the most important material developments from the 1950s for seals due to its resistance to many media, its good mechanical properties and its resistance to aging:

- aliphatic hydrocarbons (gasoline, butane, propane and natural gas)
- aromatic hydrocarbons (benzene, toluol)
- chlorinated hydrocarbons (trichloroethylene, carbon tetrachloride)
- fuels and fuels containing methanol
- mineral oils and greases, low swelling
- silicone oils and greases
- Vegetable and animal fats
- low flammability HFD pressure fluids

- high vacuum
- very good ozone and aging resistance

Not resistant to:

- Glycol-based brake fluids
- ammonia gas, amines, alkalis
- polar solvents (acetone, methyl ethyl ketone, ethyl acetate, diethylether, dioxane)
- Skydrol 500 and 7000
- superheated water vapor
- low molecular organic acids (formic and acetic acid)

Polyurethane rubber (PU, AU, EU)

Temperature resistance -35°C to +110°C, special compounds up to +125°C. Depending on the composition of the polyols used, we speak of polyester urethanes (AU) or polyether urethanes (EU). EU has better hydrolysis resistance. Both materials have excellent mechanical properties and very good abrasion resistance. They can be used in:

- mineral oils and greases with a high aromatic content (certain chemical additives can attack the material)
- Water up to 50°C (special mixtures higher)
- silicone oils and greases

- pure aliphatic hydrocarbons (propane, butane, gasoline) ; impurities such as moisture, alcohols, acidic or alkaline compounds can attack PU
- high gas tightness
- Resistant to ozone and aging

Not resistant to:

- Alcohols and glycols, ketones, esters and ethers.
- Acids and amines, alkaline
- Hot water, steam

Perfluoro rubber (FFKM)

Temperature range -15°C to +320°C, special compounds -20°C static. FFKM is the latest development in the field of high-performance materials. Despite its elastic properties, it has largely the chemical resistance of PTFE.

Mainly used in semiconductor, chemical and instrumentation industries where conventional materials are not sufficient.

Applicable in:

- almost all chemicals
- Very good oxygen and ozone resistance
- Resistant to weathering and aging
- very low weight loss at high vacuum in combination with high temperatures

Polytetrafluoroethylene (PTFE)

Temperature range -200°C to +260°C- A material which, thanks to its easy processability, is used in many cases where normal elastomers are not sufficient or FFKM materials are too expensive. Due to its hardness of approx. 95 Shore, however, it is only suitable for static use and requires separable installation spaces.

It is resistant to:

- almost all acids and alkalis
- aliphatic, aromatic chlorinated hydrocarbons

Not resistant to:

- liquid alkali metals
- Fluorine gas under pressure

Westring O-Ring compounds can be manufactured to many demanding industry standards, including FDA, USP, Elastomer Guideline-UBA (formerly KTW), DVGW, BAM, WRAS (WRC), NSF, Underwriter Laboratories (UL), Military (MIL-SPEC), Aerospace (AMS) and many customer specific requirements.

Numbering system for Westring O-Ring materials (compounds)

The base rubber and hardness, as well as the special compound of the elastomer material, determine its chemical resistance, thermal and mechanical load capacity.

The polymer code for the required compound is placed at the beginning of the compound number. The following 3-digit number indicates the specific compound and is also indicative of the hardness indicator, which does not necessarily have to be specified.

MATERIAL OVERVIEW AND PROPERTIES

Numbering system for Westring O-Ring materials (compounds)

The base rubber and hardness, as well as the special compound of the elastomer material, determine its chemical resistance, thermal and mechanical load capacity.

Polymer-Code:

AC = Polyacrylate

BT = Butyl

CS = Chlorosulfonyl polyethylene

CR = Chloroprene

EP = Etyhlen propylene + diene

FF = Perfluorocarbon

FL = Fluorosilicone

NB = Acrylonitrile butadiene

The polymer code for the required compound is placed at the beginning of the compound number. The following 3-digit number indicates the specific compound and is also indicative of the hardness indicator, which does not necessarily have to be specified.

NH = hydrogenated acrylonitrile butadiene

PT = Polytetrafluoroethylene

PU = Polyurethane

SI = Silicone

VI = Fluorocarbon

VO = Perfluorocarbon

Examples:

NB0720 NB = Polymercode 0720 Compound number (in hardness 72 Shore A)

NB0674 NB = Polymercode 0674 Compound number (in hardness 70 Shore A)

VI0780 VI = Polymerecode 0780 Compound number (in hardness 78 Shore A)

EP0720 EP = Polymercode 0720 Compound number (in hardness 70 Shore A)

17. MATERIAL COMPOUNDS FOR O-RINGS

POLYACRYLATE (ACM)

ACM (acrylic rubber) offers good resistance to mineral oil, oxygen and ozone. Water compatibility and cold flexibility of ACM are much worse than those of NBR.

Material (Hardness Shore A)	Remarks / Applications	Temperature range Static	Color
AC0872 (70)	ACM70; Euro standard material ACM80; Euro-	-20°C +150°C	BLACK
AC0531 (80)	Standard material	-20°C +150°C	BLACK

POLYCHLOROPRENE RUBBER (CR)

Also known by the trade name neoprene (chlorinated rubber), polychloroprene rubber is the first synthetically produced rubber. The material is generally characterized by good ozone, aging and chemical resistance and offers good mechanical properties over a wide temperature range.

Material (Hardness Shore A)	Remarks / Applications	Temperature range Static	Color
CR0557 (70)	Standard 70 Shore CR; good weather and salt water resistance; frequent use in refrigerants, e.g. R 134a or R22	-40°C +100°C	BLACK
CR0944 (70)	CoI-O-Ring material	-40°C +100°C	RED
CR0721 (70)	CR70. Euro standard material	-35°C +100°C	BLACK

FLUORSILICONE (FVMQ)

Fluorosilicone is a silicone polymer with fluorinated side chains with increased resistance to oils and fuels. The mechanical and physical properties are very similar to those of silicone.

Material (Hardness Shore A)	Remarks / Applications	Temperature range Static	Color
FL0677 (70)	CoI-O-Ring material; For high temperatures, good low-temperature behavior, is used in fuels and oil, predominantly for aviation.	-60°C +170°C	BLUE
FL0806 (80)	Military and aerospace approvals.	-60°C +170°C	BLUE
FL0355 (70)	70 Shore fluorosilicone, yellow.	-60°C +170°C	YELLOW
FL0559 (70)	Standard 70 Shore FVMQ	-60°C +170°C	BLUE
FL0585 (80)	Standard 80 Shore FVMQ; aerospace approvals.	-60°C +170°C	BLUE

MATERIAL COMPOUNDS FOR O-RINGS

ETHYLENE-PROPYLENE RUBBER (EPDM)

EPDM is a terpolymer of ethylene, propylene and a double-bonded, cross-linking third monomer.

Material (Hardness Shore A)	Remarks / Applications	Temperature range Static	Color
EP0529 (60)	Standard 60 Shore EPDM	-50°C +150°C	BLACK
EP0534 (70)	Peroxide cross-linked high-performance material with good compatibility to copper contact surfaces, elastomer guideline-UBA (formerly KTW) and W270, FDA compliant, Ö-Norm	-40°C + 150°C	BLACK
EP0720 (72)	Standard 70 Shore EPDM	-40°C +135°C	BLACK
EP0540 (80)	Global standard material, good CS. Steam up to 200°C, hot water, air up to 150°C, diluted acids, flame retardant hydraulic fluids on phosphate ester basis. Brake fluids on non-mineral oil basis.	-50°C +150°C	BLACK
EP0609 (70)	Global standard material; elastomer guideline-UBA (formerly KTW) + WRAS (WRC) approvals.	-50°C +150°C	BLACK
EP0678 (80)	Col-O-Ring material	-50°C +150°C	VIOLET
EP0704 (70)	EPDM70; For industrial/cooling water applications; Euro-Standard material	-50°C +150°C	BLACK
EP0804 (90)	Standard 90 Shore EPDM; Parbak material	-50°C +150°C	BLACK
EP0809 (80)	EPDM 80; Euro-standard material	-50°C +150°C	BLACK
EP0556 (70)	For industrial/cooling water applications; Improved aging resistance	-50°C +150°C	BLACK
EP0664 (70)	EPDM70 with Elastomer Guideline-UBA (formerly KTW) + WRAC (WRC) approvals; Euro-Standard material	-50°C +150°C	BLACK
EP0743 (70)	FDA Compliant	-50°C +150°C	BLACK

NITRILE BUTADIENE (NBR)

Nitrile butadiene terpolymer is commonly known as nitrile rubber (NBR). The acrylonitrile content of nitrile sealing materials varies widely (18 to 50%). Polymers with higher ACN content are characterized by lower

swelling behavior in gasoline and aromatic solvents, while polymers with lower ACN content exhibit better compression set and lower flexibility at low temperatures. The polymer is also known as Buna-N.

Material (Hardness Shore A)	Remarks / Applications	Temperature range Static	Color
NB0540 (40)	NBR40 Standard material	-35°C +100°C	BLACK
NB0550 (50)	NBR50 Standard material	-35°C +100°C	BLACK
NB0560 (60)	NBR60 Standard material	-35°C +100°C	BLACK
NB0780 (80)	NBR80 Standard material	-35°C +100°C	BLACK
NB0880 (90)	NBR90 Standard material	-30°C +100°C	BLACK
NB0720 (72)	NBR72 Standard material, generally used in hydraulics and pneumatics for hydraulic oils, water glycols, (HFC-fluids) and oil in water emulsions (HFA-fluids); Resistant to mineral oils and mineral oil products, animal and vegetable	-35°C +100°C	BLACK
NB0505 (50)	NBR50 with improved ozone and weathering resistance	-35°C +100°C	BLACK
NB0676 (70)	NBR70 with improved ozone protection	-35°C +100°C	BLACK
NB0575 (75)	NBR50 with improved low temperature and oil resistance	-50°C +100°C	BLACK
NB0674 (70)	NBR70 Special material	-35°C +100°C	BLACK
NB0578 (80)	NBR80 Special material	-40°C +100°C	BLACK
NB0552 (90)	NBR90 Special material	-30°C +100°C	BLACK
NB0829 (70)	NBR70 according to ELL-UBA (elastomer guideline of the Federal Environment Agency) former KTW, drinking water release	-30°C +100°C	BLACK

MATERIAL COMPOUNDS FOR O-RINGS

HYDROGENATED NBR (HNBR)

Hydrogenated NBR was developed as an air-resistant variant of nitrile rubber. In HNBR materials, the carbon-carbon double bonds within the main polymer chain are saturated with hydrogen atoms.

This process, called „hydrogenation,“ improves the thermal stability and oxidation resistance of the material.

Material (Hardness Shore A)	Remarks / Applications	Temperature range Static	Color
NH0510 (85)	Standard 85 Shore HNBR	-35°C +150°C	BLACK
NH0512 (90)	Standard 90 Shore HNBR	-35°C +150°C	BLACK
NH0720 (72)	Standard 72 Shore HNBR	-35°C +150°C	BLACK
NH0554 (75)	Standard 75 Shore HNBR.	-35°C +150°C	LIGHT GREEN
NH0573 (75)	Standard 75 Shore HNBR	-35°C +150°C	BLACK
NH0723 (80)	HNBR 80, Euro standard material.	-35°C +150°C	BLACK
NH0813 (70)	Low temperature HNBR.	-40°C +150°C	BLACK
NH0831 (70)	HNBR70, Euro standard material.	-35°C +150°C	BLACK
NH0837 (85)	Standard 85 Shore HNBR	-35°C +150°C	GREEN
NH0505 (70)	Suitable for use in biodiesel (RME) up to +80°C.	-35°C +150°C	GREEN
NH0570 (60)	HNBR60, Euro standard material.	-35°C +150°C	BLACK
NH0680 (90)	Low temperature HNBR.	-40°C +150°C	BLACK

SILICONE RUBBER (VMQ)

Silicone elastomers have relatively low tensile strength and poor wear resistance. Silicones have good insulating properties and tend to be physiologically neutral.

Material (Hardness Shore A)	Remarks / Applications	Temperature range Static	Color
SI0595 (50)	Standard 50 Shore MVQ	-55°C +200°C	RED
SI0720 (72)	Global standard material, Col-O-Ring material. Hot air (up to 210°C), Oxygen, water (up to 100°C). Only use as stat. Gasket, 72 Shore	-55°C +200°C	RED
SI0604 (70)	Global standard material, 70 Shore	-55°C +200°C	RED
SI0613 (60)	Standard 60 Shore MVQ	-55°C +200°C	RED
SI0614 (80)	Global standard material, 80 Shore	-55°C +200°C	RED

LIQUID SILICONE (LSR)

Liquid silicones are particularly suitable for large-scale production of O-Rings and molded parts. For this processing, own processing machines are necessary.

Material (Hardness Shore A)	Remarks / Applications	Temperature range Static	Color
SI0697 (40)	Standard 50 Shore LSR	-50°C +200°C	RED BROWN
SI0695 (60)	Standard 60 Shore LSR	-50°C +200°C	RED BROWN
SI0693 (50)	Standard 40 Shore LSR	-50°C +200°C	RED BROWN
SI0698 (70)	Standard 70 Shore LSR	-50°C +200°C	RED BROWN

MATERIAL COMPOUNDS FOR O-RINGS

FLUOROCARBON (FKM)

Fluorocarbon (FKM) offers excellent resistance to high temperatures and a wide range of chemicals. Tightness and compression set are also excellent.

Material (Hardness Shore A)	Remarks / Applications	Temperature range Static	Color
VI0709 (90)	Standard FKM, 90 Shore	-25°C +200°C	BLACK
VI0780 (78)	Global standard material, for high temperatures, hot oils, aromatic solvents, many chemicals, flame retardant liquids based on phosphate esters and chlorinated hydrocarbons;	-25°C +200°C	BLACK
	Copolymer, 78 Shore		
VI0747 (70)	Global Standard FKM, 75 Shore	-25°C +200°C	BLACK
VI0763 (60)	FKM 60 Shore	-25°C +200°C	BROWN
VI0884 (75)	Col-O-Ring material; Copolymer	-25°C +200°C	BROWN
VI0894 (90)	Col-O-Ring material; media resistance as VI747	-25°C +200°C	BROWN
VI0642 (75)	Terpolymer	-25°C +200°C	BLACK
VI0670 (70)	FKM 70 Shore	-25°C +200°C	GREEN
VI0681 (80)	FKM 80 Shore	-25°C +200°C	GREEN
VI0701 (70)	FKM 70; Euro Standard Material	-25°C +200°C	BLACK
VI0736 (75)	Terpolymer; Improved cold flexibility	-28°C +200°C	BLACK
VI0738 (75)	Highly fluorinated FKM	-20°C +200°C	BLACK
VI0521 (75)	FKM75, red, Euro standard material	-25°C +200°C	RED
VI0592 (75)	Low temperature FKM	-40°C +200°C	BLUE
VI0688 (75)	Low-temperature FKM with improved media resistance	-35°C +200°C	BLACK
VI0703 (75)	Improved low-temperature flexibility; Suitable for use in biodiesel (RME)	-30°C +200°C	BLACK
VI0722 (75)	Improved water/glycol resistance as well as acids	-25°C +200°C	BLACK
VI0750 (70)	FDA compliant	-25°C +200°C	BLACK

HIGH PERFORMANCE Standard FFKM

In almost all media, high-performance standard FFKM materials offer better chemical stability than highly fluorinated materials (Hi-FPM) from other manufacturers, but are already on their level in terms of price. However, here you have a real FFKM compound.

Material (Hardness Shore A)	Remarks / Applications	Temperature range Static	Color
FFKM0602	Hardness 60 Sh. IRHD Standard material	-10°C +320°C	BLACK
FFKM0603	Hardness 60 Sh. IRHD Standard material	-10°C +240°C	WHITE
FFKM0705	Hardness 70 Sh. IRHD Standard material	-10°C +280°C	BLACK
FFKM0709	Hardness 70 Sh. IRHD Standard material	-15°C +250°C	WHITE
FFKM0804	Hardness 80 Sh. IRHD Standard material	-10°C +320°C	BLACK
FFKM0902	Hardness 90 Sh. IRHD Standard material	-10°C +240°C	BLACK
FFKM0901	Hardness 90 Sh. IRHD Standard material	-10°C +320°C	BLACK
V0060A	Hardness 60 Sh. IRHD Standard material	-15°C +260°C	BLACK
V0070A	Hardness 70 Sh. IRHD Standard material	-15°C +260°C	BLACK
V0074S	Hardness 72 Sh. IRHD Standard material	-15°C +260°C	WHITE
V0075S	Hardness 75 Sh. IRHD Standard material	-15°C +310°C	WHITE
V0075B	Hardness 78 Sh. IRHD Standard material	-15°C +325°C	BLACK
V0080A	Hardness 80 Sh. IRHD Standard material	-15°C +260°C	BLACK
V0092E	Hardness 90 Sh. IRHD Standard material	-15°C +260°C	BLACK

Perfluoro rubber FFKM

Westring perfluorocarbon rubber compounds are made from advanced third generation perfluorinated elastomers (FFKM), originally patented by Du Pont.

Compared to other perfluorinated elastomers, Westring FFKM materials offer excellent permanent elasticity, a very good compression set as they have been specifically tailored for sealing applications.

FFKM elastomers are terpolymers consisting of tetrafluoroethylene (TFE), perfluoromethylvinyl ether (PMVE) and a crosslinking monomer (cure site monomer, CSM).

Tetrafluoroethylene (TFM) as the base monomer provides the chemical stability, while the elastic properties are achieved by crosslinking with perfluoromethyl vinyl ether (PMVE) and the perfluorinated crosslinking monomer (CSM).

MATERIAL COMPOUNDS FOR O-RINGS

PERFLUOR-ELASTOMER (for large series)

Perfluoroelastomer is a rubber version of PTFE. The materials are generally available from Westring under the generic term FFKM materials.

Material	Remarks / Applications	Temperature range Static	Color
FFKM0602	High-temperature material for low-horsepower applications	-10°C +320°C	BLACK
FFKM0603	Universal material for use in the food industry, FDA compliant 21 Cfr 177.2600, good chemical resistance	-10°C +240°C	WHITE
FFKM0705	Universal material with good thermal properties for medium and large quantities	-10°C +280°C	BLACK
FFKM0709	Material for use in the food industry, FDA compliant 21 Cfr 177.2600, extended temperature range	-15°C +250°C	WHITE
FFKM0804	Material for very high temperatures and good compression set behavior	-10°C +320°C	BLACK
FFKM0902	Material of the for application at higher pressures with sudden pressure drop, explosive decompression, good chemical resistance	-10°C +240°C	BLACK
FFKM0901	Material designed for application at higher pressures with sudden pressure drop, explosive decompression, high thermal stability	-10°C +320°C	BLACK
FFKM0805	Universal high temperature material with 80°C IRHD and good chemical resistance	-15°C +290°C	BLACK
FFKM0757	Material with a hardness of 75° IRHD designed for best chemical resistance	-15°C +240°C	BLACK
FFKM0753	Material with a hardness of 75° IRHD designed for best thermal resistance, FDA compliant 21 Cfr 177.2600	-10°C +320°C	WHITE
FFKM0801	Material with a hardness of 80° IRHD designed for best thermal resistance, FDA compliant 21 Cfr 177.2600	-10°C +320°C	WHITE

PERFLUOR-ELASTOMER (for quick availability / small series)

Perfluoroelastomer is a rubber version of PTFE. The materials are generally available from Westring under the generic term FFKM materials.

Material	Remarks / Applications	Temperature range Static	Color
V0060A	Universal material for low shore applications	-15°C +260°C	BLACK
V0070A	Universal material covering most applications for this temperature range. Good chemical resistance.	-15°C +260°C	BLACK
V0074S	FDA food and pharmaceutical approval + USP Class VI, 3-A Standard 18-03 Kl.1	-15°C +260°C	WHITE
V0075S	FDA food and pharmaceutical approval + USP Class VI, 3-A Standard 18-03 Kl.1	-15°C +310°C	WHITE
V0075B	Universal material for very high temperatures	-15°C +325°C	BLACK
V0080A	Universal material that covers most applications for this temperature range. Good mechanical properties.	-15°C +260°C	BLACK
V0092E	good material for use with very rapid pressure drop, explosive decompression	-15°C +260°C	BLACK
V0075M	Universal material with a hardness of 72° IRHD with very good mechanical properties	-15°C +260°C	BLACK
V0076P	Material with a hardness of 65° IRHD, developed for manufacturing in the semiconductor industry	-15°C +275°C	TRANSPARENT
V0074P	Material with a hardness of 75° IRHD, developed for manufacturing in the semiconductor industry	-15°C +275°C	TRANSPARENT
V0075H	Ultra-pure material with a hardness of 75° IRHD, plasma-resistant, ery low helium leakage rate	-15°C +320°C	WHITE
V0075T	Universal material with a hardness of 75° IRHD, very low compression set, highest temperatures	-15°C +330°C	BLACK
V0075L	Cryogenic material with a hardness of 75° IRHD and modified polymer structure	-45°C +250°C	BLACK
V0090L	Cryogenic material with a hardness of 90° IRHD and modified polymer structure	-45°C +240°C	BLACK

Contact with media which have an aggressive effect on the respective material may limit the specified temperature ranges. The recommendations in the column Remarks/Applications regarding the media resistance or the application range are based on currently available test and laboratory experience and have the character of a technical solution suggestion.

The user must therefore always check and approve the suitability of the technical design under the influence of the medium to be sealed. Westring does not give any guarantee with regard to the form, installation situation or function of a product in any application.

18. RELEASES

Materials with FDA conformity (FDA, BgVV)

Seals that come into contact with food must comply with the Foodstuffs Act. The Federal Institute for Consumer Health Protection and Veterinary Medicine BgVV has defined the type of substances that are harmless to health and have permissible migration (migration or leaching). According to the Recommendation XXI of the BgVV, the consumer goods made of rubber are divided into 4 categories (in gradations according to the duration of contact of a seal with the foodstuff) and into a special category according to the different conditions of use occurring in practice.

The silicone elastomers are suitable for use in this application in terms of their physiological properties, as they are inert and odorless and tasteless. Consult our application engineering department for material selection based on your application.

The FDA - Food and Drug Administration (USA), has, similar to the BgVV a list of elastomer substances that are not toxic (poisonous) or carcinogenic (cancer causing). In addition, extraction tests in accordance with FDA requirements can be demanded by elastomer manufacturers, which must be complied with. Here, too, various compounds are available in the different material classes EPDM, MVQ, FPM and FFKM, which we will be pleased to offer you according to the description of your application requirements.

Materials with Elastomer Guideline-UBA (formerly KTW) Approval

Elastomer Guideline-UBA (formerly KTW) – Components for Drinking Water Systems. This is the nationwide health standard in Germany for all devices, components and materials that come into contact with drinking water. We process a range of materials with elastomer guideline UBA (formerly KTW) approvals in the elastomer groups EPDM, NBR and MVQ which we will be pleased to offer you after describing your application conditions. At the customer's request, it is also possible to process special compounds from certain specified compound manufacturers.

Materials with W270 approval

In addition to the elastomer guideline UBA (formerly KTW) test, a time-dependent test is carried out in drinking water to assess the microbiological behavior, i.e. the sterility of the elastomer materials.

Materials for gas supply and consumption equipment

There are various materials that have been approved by the German Technical and Scientific Association for Gas and Water (DVGW). Since the application and customer requirements can be very extensive, we ask for your inquiry.

19. MEDIA RESISTANCE TABLE FOR ELASTOMERS

Based on decades of experience in the application of many customers as well as numerous laboratory tests, we have already tested a whole range of media with the compatibility of different elastomers. Despite all the knowledge gained from this, many other factors can significantly limit the

durability of seals in practical use. Therefore, this information regarding durability can only be regarded as a generally valid assessment. The user must always carry out the necessary tests for his application. Westring accepts no liability for this information.

In the following table the rating means:

1 = resistant (swelling 0 - 5%)

2 = limited resistance (swelling 5 - 10%)

3 = conditionally resistant, only for static use (swelling 10 - 20%)

4 = unstable, open fields = not tested

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
A1-NH3-CR-K	1	1	1	1	1	1		4	1	4	1		
Acetaldehyde	2	1	1	4	3	3	4	4	2	4		4	1
Acetamide (acetic acid amide)	4	1	1	1	2	2	4	4	2	1	1	2	1
Acetic acid 10%, 100°C	4			4		4	4		4				
Acetic acid 10%, 50°C	4			4		4	4		4				
Acetic acid 25%, 100°C	4			4		4	4		4				
Acetic acid 25%, 50°C	4			4		4	4		4				
Acetic acid 50%, 100°C	4			4		4	4		4				
Acetic acid 50%, 50°C	4			4		4	4		4				
Acetic acid 75%, 100°C	4			4		4	4		4				
Acetic acid 75%, 50°C	4			4		4	4		4				
Acetic acid, 30%	2	2	1	2	2	1	4	4	1	2		2	1
Acetic acid, glacial acetic acid	2	2	1	3	3	4	4	4	2	4		3	1
Acetic acid, hot (high pressure)	4	4	3	4	4	4	4	4	3	4		4	1
Acetic anhydride	2	2	2	3	1	2	4	4	3	4	2	4	1
Acetic potash	1	1	1	2	2	2	4	4	4	4		4	1
Acetic soda	1	1	1	2	2	2	3	3	4	4		4	1
Acetoacetic ester	3	2	2	4	4	4	4	4	2	4		4	1
Acetone	3	1	1	4	2	3	4	4	3	4	4	4	1
Acetone 20	2			4		3			3				

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Acetone 30	3			4		3			3				
Acetophenone	4	1	1	4	4	4	4	4	4	4		4	1
Acetylacetone	4	1	1	4	4	4	4	4	4	4		4	1
Acetyl chloride (acetic acid chloride)	4	4	4	4	4	4	4	4	3	1		1	1
Acetylene (ethyne)	2	1	1	1	2	2	4	4	2			1	1
Acrylic acid ethyl ester	4	2	2	4	4	4	4	4	2	4		4	1
Acrylonitrile	4	4	4	4	3	4	4	4	4	4		3	1
Adhesive, glue (DIN 16920)	2	2	1	1	1	1	1		1	1		1	
Adipic acid (E 355)	1	1	1	1		1				1		1	1
Aero Lubriplate	4	4	4	4	3	4	4	4	4	4		3	1
Aero Shell 17 Lubricant	4	4	4	1	1	2	1	1	2	1		1	1
Aero Shell 750	4	4	4	2	2	4	4	2	4	2		1	1
Aero Shell 7A Lubricant	4	4	4	1	1	2	1	1	2	1		1	1
Aero Shell Fluid 4 (41)	4	4	4	1	1	4	2	2	4	1		1	1
Aero Shell IAC	4	4	4	1	1	2	1	1	2	1		1	1
Aerosafe 2300	4	2	1	4	4	4	4	4	3	3		4	1
Aerosafe 2300W	4	2	1	4	4	4	4	4	3	3		4	1
Aerozene 50 (50% hydrazine, 50% UDMH)	4	1	1	3	3	4	4		4	4		4	1
Air (long-term weathering)	3	1	1	3	3	1	3	1	1	1		1	1
Air, 260°C	4	4	4	4	4	4	4	4	4	2		3	1
Air, oil-free, 100°C	2	1	1	1	1	1	2	1	1	1		1	1
Air, oil-free, 150°C	4	2	2	2	2	2	3	2	1	1		1	1
Air, oil-free, 200°C	4	4	4	4	4	4	4	4	1	2		1	1
Alkali solution, caustic soda solution	1	1	1	2	2	2	4	4	2	2		2	1
Alkazene ® (dibromoethylbenzene)	4	4	4	4	4	4	4	4	4	2		2	1
Alum	1	1	1	1	1	1		4	1			1	1
Aluminum acetate (aqueous solution)	1	1	1	2	1	2	4	4	4	4		4	1
Aluminum bromide	1	1	1	1	1	1	3	1	1	1		1	1
Aluminum chloride (aqueous solution)	1	1	1	1	1	1	3	1	2	1		1	1
Aluminum fluoride (aqueous solution)	2	1	1	1	1	1	3		2	1		1	1
Aluminum nitrate (aqueous solution)	1	1	1	1	1	1	3		2			1	1
Aluminum phosphate (aqueous solution)	1	1	1	1	1	1			1			1	1
Aluminum sulfate (aqueous solution)	1	1	1	1	1	1	4	4	1	1		1	1
Ambrex 33 (mobile)	4	4	4	1	1	2	2	1	4	3		1	1
Ambrex 850 (mobile)	4	3	3	1	1	2	1	1	2	1		1	1
Amine mixture	2	2	2	4	4	2	4	4	2	4		4	1
Ammonia (gaseous, cold)	1	1	1	1	1	1	3	4	1	4	1	4	1
Ammonia (gaseous, hot)	4	2	2	4	2	2	4	4	1	4		4	1
Ammonia solution (10%, 50°C)	4	1	1	2	2	4	4		4				1
Ammonia solution (25%, room temp.)	4	1	1	1	1	2	3		2				1
Ammonia solution (conc. room temp.)	4	1	1	1	1	4	4	4	1	2		1	1
Ammonia, anhydrous	4	1	1	2	2	1	4	4	3	4		4	1
Ammonium carbonate (aqueous solution)	1	1		4		1	4	4			1	1	1
Ammonium chloride	1	1	1	1	1	1	1	1	2	1		1	1
Ammonium chloride (aqueous solution)	1	1	1	1	1	1	1					1	1
Ammonium chloride, 2 molar solution	1	1	1	1	1	1							1
Ammonium hydroxide (concentrated)	4	1	1	4		1	4	4	1	2		2	1
Ammonium hydroxide, 3 molar solution	2	1	1	1	1	1	4	4	1	1		2	1
Ammonium nitrate (aqueous solution)	3	1	1	1	1	1	4	2			1	1	1
Ammonium nitrate, 2 molar solution	1	1	1	1	1	1		4					1
Ammonium nitrite (aqueous solution)	1	1	1	1	1	1			2			1	
Ammonium persulfate	4	1	1	4	4	1	4	4					1
Ammonium persulfate (aqueous solution)	1	1	1	4	4	1	4	4				1	1
Ammonium persulfate solution	1	1	1	4	4		4	4					1
Ammonium phosphate	1	1	1	1	1	1			1				1
Ammonium phosphate (aqueous solution)	1	1	1	1	1	1			1			1	1
Ammonium phosphate, primary	1	1	1	1	1	1			1				1
Ammonium salts	1	1	1	1	1	1		3	1	3		3	1
Ammonium sulfate (aqueous solution)	1	1	1	1	1	1	1	4				2	1
Ammonium sulfide	1	1	1	1	1	1		4				4	1
Amyl acetate (acetic acid amyl ester)	4	3	3	4	4	4	4	4	4	4		4	1
Amyl alcohol (pentanol)	2	1	1	2	1	2	4	4	4	1		2	1
Amyl borate	4	4	4	1	1	1						1	1
Amyl chloride	4	4	4	4	4	4	4	4	4	3		1	1
Amyl chloronaphthalene	4	4	4	4	4	4	4	4	4	2		1	1
Amyl chloronaphthenate	4	4	4	4	4	4	4	4	4	2		1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Amyl naphthalene	4	4	4	4		4	4	2	4	1		1	1
Amyl naphthenate	4	4	4	4		4	4	2	4	1		1	1
Anderol L 774 (di-ester)	4	4	4	2	2	4	4	2	4	2		1	1
Anderol L 774, 100°C	4			3		4	1		2				
Anderol L 826	4	4	4	2	2	4	4	2	4	2		1	1
Anderol L 829	4	4	4	2	2	4	4	2	2	2		1	1
Ang-25 (di-ester base) (TG 749)	4	4	4	2	2	4	4	2	2	2		1	1
Ang-25 (glycerol ester)	2	2	1	2	2	2	4	4	2	2		1	1
Aniline (aminobenzene)	4	1	1	4		4	4	4	4	3	1	3	1
Aniline dye	2	2	1	4	2	2	4	4	3	2		2	1
Aniline hydrochloride	2	2	2	2	4	4	4	4	4	2		2	1
Aniline, 50°C	2			4		4	4		1				
Animal Fats	4	2	2	1	2	2	1	1	2	1		1	1
Animal Oil	4	2	2	1	1	2	2	1	2	1		1	1
AN-O-3 Grade M	4	4	4	1	1	2	1	1	2	1		1	1
AN-O-366	4	4	4	1	1	2	1	1	4	1		1	1
AN-O-6	4	4	4	1	1	2	1	1	4	1		1	1
Ansul Ether (anesthetic)	4	3	3	3	4	4	2	4	4	3		4	
Ansul Ether 161 or 181	4	3	3	3	3	4	2	4	4	3		4	1
AN-W-O-366b Hydraulic fluid	4	4	4	1	1	2	2	2	4	1		1	1
Aqua regia	4	4	3	4	2	4	4	4	4	3		2	1
Argon	1	1	1	1	1	1	1	1	1	1		1	1
AROCLOR 1248	4	3	3	3	1	4	4	4	2	2		1	1
AROCLOR 1254	4	4	3	4	4	4	4	4	3	2		1	1
AROCLOR 1260	1	1	1	1	1	1	4	4	2	1		1	1
Aromatic fuels 50% (Fuel C)	4	4	4	2	2	4	4	4	4	2		1	1
Arsenic acid	2	1	1	1	1	1	3	3	1	1		1	1
Arsenic trichloride (aqueous solution)	4	3	3	1		1						4	1
Askarel (PCB, room temp.)	4	4	4	4	4	2	4	4	4	2		1	1
Askarel transformer oil	4	4	4	2		4	4	4	4	2		1	1
Asphalt (DIN 55946)	4	4	4	2	2	2	2	2	4	2		1	1
ASTM fuel no. 1, 20°C	4			1		2	1		4				
ASTM fuel no. 1, 50°C	4			1		2	1		4				
ASTM fuel no. 2, 20°C	4			3		3	2		4				
ASTM Fuel No. 2, 50°C	4			3		4	2		4				
ASTM Fuel No. 3, 20°C	4			4		4	2		4				
ASTM Fuel No. 3, 50°C	4			4		4	3		4				
ASTM Oil No. 1	4	4	4	1	1	1	3	1	1	1		1	1
ASTM Oil No. 1, 100°C	4			1		2	1		1				
ASTM oil no. 1, 70°C	4			1		2	1		1				
ASTM oil no. 2	4	4	4	1	1	4	3	1	3	1		1	1
ASTM Oil No. 2, 100°C	4			1		3	1		1				
ASTM oil no. 2, 70°C	4			1		3	1		1				
ASTM oil no. 3	4	4	4	1	1	4	3	1	4	1		1	1
ASTM Oil No. 3, 100°C	4			2		4	1		3				
ASTM oil no. 3, 70°C	4			2		4	1		3				
ASTM oil no. 4	4	4	4	2	2	4	4	2	4	2		1	1
ASTM reference fuel A	4	4	4	1	1	3	1	1	4	1		1	1
ASTM reference fuel B	4	4	4	1	2	4	3	4	4	1		1	1
ASTM reference fuel C	4	4	4	4	4	4	4	4	4	1		1	1
ASTM service fluid 100, 100°C	4			4		3	1		4				
ATF 1300 A, 100°C	4			1		3	1		3				
ATF oil	4	4	4	1	1	2	2	1	4			1	1
ATL-857	4	4	4	2	2	4	4	2	4	2		1	1
Atlantic Dominion F	4	4	4	1	1	4	2	1	4	1		1	1
Aurex 903R (Mobile)	2	4	4	1	1	2	1	1	4	4		1	1
Bacon, animal fat (see animal oil)	4	2	2	1	1	2	1	1	2	1		1	1
Banana oil (amyl acetate)	4	3	3	4	4	4	4	4	4	4		4	
Bardol B	4	4	4	4	4	4	4	4	4	2		1	1
Barium chloride (aqueous solution)	1	1	1	1	1	1	1	1	1	1		1	1
Barium hydroxide (aqueous solution)	1	1	1	1	1	1	4	4	1	1		1	1
Barium salts	1	1	1	1	1	1	1	1	1	1		1	1
Barium sulfate (aqueous solution)	1	1	1	1	1	1	1	4	1	1		1	1
Barium sulfide (aqueous solution)	1	1	1	1	1	1	1	4	1	1		1	1
Bayol 35	4	4	4	1	1	2	2	1	4	1		1	1
Bayol D	4	4	4	1	1	2	4	1	4	1		1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Beer	1	1	1	1	1	1	2	4	1	1		1	
Beer wort	4		3	1	1		4	4	1	2		1	1
Beet oil	4	3	1	2	2	3	1	1	1	1		1	1
Beet sugar liquid	1	1	1	1		2	4	4	1	1		1	
Benzaldehyde (artificial bitter almond oil)	4	1	1	4	1	4	4	4	2	3	2	4	
Benzene	4	4	4	4	4	4	3	4	4	3	3	1	1
Benzene, 20°C	4			4		4	4			4			
Benzene, 50°C	4			4		4	4			4			
Benzenesulfonic acid	4	4	3	4	1	2	4	4	4	2		1	2
Benzenesulfonic acid, 10%						1				3		1	1
Benzoic acid (E 210)	4	4	3	3	4	4	4	3	3	2		1	1
Benzoic acid benzyl ester	4	4	4	4	4	4	4	4	4	1		1	1
Benzoic acid benzyl ester (benzyl benzoate)	4	2	4	4	4	4	4	4		1		1	1
Benzophenone	4	3	3				4	4		1		1	1
Benzoyl chloride	4	4	4	4	4	4		4		2		2	1
Benzyl alcohol	4	1	1	4	2	2	4	4	2	2	1	1	1
Benzyl benzoate (benzoic acid benzyl ester)	4	2	4	4	4	4	4	4		1		1	1
Benzyl chloride	4	4	4	4	4	4	4	4	4	2	1	1	1
Biphenyl (diphenyl, phenylbenzene)	4	4	4	4	4	4	4	4	4	2		1	1
Biphenyl, room temp.	4	4	4	4	4	4	4	4	4	2	2	1	1
Bisulfite lye	3	1	1	3	3	1	4	4	2	2		1	1
Black liquor	2	2	2	2	2	2	4	4	2	2		1	1
Black point 77	3	1	1	1	1	3	3	3	3	3		1	1
Blast furnace gas	4	4	4	4	4	4	4	4	1	2		1	1
Blast Furnace Gas	4	4	4	4	4	4	4	4	3	3		1	1
Blast furnace gas, room temp.	4	4	4	4	4	4	4	4	1	2		1	1
Bleach solution	4	1	1	4		4	4	4	2	2	1	1	
Bleach solution, room temp.	4	1	1	4	1	4	4	4	2	2	1	1	1
Borax (aqueous solution)	1	1	1	1	1	1	4	4	1	1		1	1
Borax solution (disodium tetraborate)	2	1	1	2	1	1	1	2	2	2		1	1
Boric acid	1	1	1	1	1	1	1	4	1	1		1	1
Boric acid, 10%	1	1	1	1	1	1	4	4	3	1		1	1
Boron liquid (HEF)	4	4	4	2	2	4	4	4	4	2		1	1
Boron mixture	2	1	1	2		2	4	4	2	2		1	1
Boron oil	4	4	4	1	1	2	1	1	4	1		1	1
BP-Energol oil HD SAE 10 W, 100°C	4			1		3	4		2				
BP-Energol oil HTB 2, 100°C	4			2		2	4		1				
BP-Energol oil LS 2, 100°C	4			1		4	4		2				
BP-Hydrolube NF-46/PC 2181, 100°C				1									
BP-Longlife oil, 100°C	4			1		3	3		2				
BP-Visco-Static oil, 100°C	4			1		2	4		1				
Brake fluid (glycol-based)	1	1	1	3	2	3	4	4	3	4		4	1
Brake fluid, 100°C	4			4		3	4		1				
Brake fluid, 20°C	1			3		2	4		1				
Brake fluid, 50°C	1			3		2	4		1				
Brake fluid, room temp.	2	2	1	2	2	3			3	4		3	1
Brant, fruit water	1	1	1	1	1	1	4	4	1	1		1	1
Bray GG-130	4	4	4	2	2	4	4	2	4	2		1	1
Brayco 719-R(W-H-910)	2	2	1	3	3	2	4	4	2	2		4	1
Brayco 885 (MIL-L-6085A)	4	4	4	2	2	4	1	2	4	2		1	1
Brayco 910	1	1	1	2	2	2	3	3	4	4		4	
Bret 710	1	1	1	2	2	2	3	3	4	4		4	1
Brine, room temp.	1	1	1	1	1	1	2	4	1	1		1	1
Bromine trifluoride	4	4	4	4	4	4	4	4	4	4		4	2
Bromine water	4	3	2	4	1	4	4	4	4	2		1	
Bromine water, saturated	4	4	3	4	4	4	4	4	4	3		1	1
Bromine, anhydrous	4	4	4	4	4	4	4	4	4	2		1	1
Bromine, liquid	4	4	4	4	4	4	4	4	4	3		1	1
Bromine, room temp.	4			4		3	4		3				
Bromobenzene	4	4	4	4	4	4	4	4	4	1		1	1
Bromochloromethane	4	2	2	4	4	4	4	4	4	2		1	1
Bromochlorotrifluoroethane	4	4	4	4	4	4	4	4	4	2		1	1
Bromomethane (methyl bromide, room temp.)	4	4	4	4	4	2		3	1			1	1
Bunker oil	4	4	4	1	4	4	2	1	2	1		1	
Bunker oil (for bunker oil C: FKM)	4	4	4	1	1	4	3	1	3	1		1	1
Butadiene	4	4	3	4	3	4	4	4	4	2		1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Butane	4	4	4	1	2	1	1	1	4	1		1	1
Butane, 2,2-dimethyl-	4	4	4	1	1	2	4	1	4	1		1	1
Butane, 20°C	4			2		3	1		4				
Butane, butane gas	4	4	4	1	1	1	1	1	4	1		1	1
Butanol (N-butyl alcohol)	1	2	2	1	1	1	4	4	4	2	1	1	1
Butanol-(I), 100°C	4			4		2	4		4				
Butanol-(I), 50°C	3			2		1	4		3				
Butanol-(I), room temp.	2	2	2	2	2	2	4	4	2	2	1	1	1
Butanone (methyl ethyl ketone, room temp.)	4	2	1	3	4	4	4	4	4	4	4	4	1
Butene, room temp.	4	4	4	3	4	2	4	4	4	2		1	1
Butter (animal fat)	4	2	1	1	2	2	1	1	2	1		1	1
Butter, 50°C	4			1		4	1		1				
Butyl acetate (acetic acid butyl ester)	4	3	3	4	4	4	4	4	4	4	4	4	1
Butyl acetyl ricinoleate	4	1	1	3	2	2	4			2		1	1
Butyl acrylate	4	4	4	4	4	4		4		4		4	1
Butyl alcohol (butanol)	1	2	2	1	1	1	4	4	2	2	1	1	1
Butyl benzoate	3	2	2	4	4	4		4		1		1	1
Butyl Carbitol (r), room temp.	4	1	1	3	2	4		4	4	4		2	1
Butyl cellosolve (r), room temp.	4	1	1	3	2	3	4	4		4		4	1
Butyl cellosolve Adipate	4	2	2	4	4	4	4	4	2	2		2	1
Butyl ethyl diglycol (CARBITOL)	4	1	1	4		3		4	4	4		3	1
Butyl glycol	4	2	2	3	3	3	4	4		4		4	1
Butyl glycol adipate	4	2	2	4	4	4	4	4	2	2		2	1
butyl glycol ether (CELLOSOLVE)	4	1	1	3		3	4	4		4		4	1
Butyl mercaptan	4	4	4	4	4	4		4	4			1	1
Butyl oleate	4	2	2	4	4	4				2		1	1
Butyl pyrocatechol	4	2	2	4	4	2		4		1		1	1
Butyl stearate (stearic acid butyl ester)	4	3	3	2	4	4				2	1	1	1
butyl(-t)-mercaptan, RT	4	4	4	4	4	4	4	4	4			1	1
Butyl(-t)pyrocatechol, room temp.	4	2	2	2	2	4	4	4		1		1	1
Butylamine	4	3	2	3	4	4	4	4	4	4		4	1
Butylcarbitol	4	1	1	4	4	3		4	4	4		3	1
Butylene (butene)	4	4	4	2		3	4	4	4	2		1	1
Butyraldehyde (butanal)	4	2	2	4	4	3	4	4	4	4		4	2
Butyric acid		2	2	4	4	4	4					2	1
Butyric acid butyl ester	4	1	1	4	4	4		4		1		1	1
Calcium acetate	1	1	1	2	2	2	4	4	4	4		4	1
Calcium acetate (aqueous solution)	1	1	1	2	2	2	4	4	4	4	1	4	1
Calcium acetate (aqueous solution)	1	1	1	1	1	1	4	4	4	1		4	1
Calcium bisulfite	4	4	4	1	1	1	1	4	1	1		1	1
Calcium carbonate	1	1	1	1	1	1	3	3	1	1		1	1
Calcium chloride (aqueous solution)	1	1	1	1	1	1	4	4	1	1		1	1
Calcium chloride (aqueous solution))	1	1	1	1	1	1	1	1	1	1	1	1	1
Calcium cyanide	1	1	1	1	1	1			1				1
Calcium hydrogen sulfite (aqueous solution)	4	4	4	4	1	1	1	4	1	1		1	1
Calcium hydroxide (aqueous solution)	1	1	1	1	1	1	1	4	1	1	1	1	1
Calcium hydroxide (aqueous solution)	1	1	1	1	1	2	4	4	1	1		3	1
Calcium hypochlorite	4	1	1	4	4	4	4	4		1		1	1
Calcium hypochlorite	2	1	1	2	2	2	4	4	2	2		1	1
Calcium hypochlorite (aqueous solution)	3	1	1	2	1	3	4	4	2	2	1	1	1
Calcium hypochlorite, 15% solution	1	1	1	4	4	3	4	4	4	4		1	1
Calcium nitrate (aqueous solution)	1	1	1	1	1	1	1	1	2	1	1	1	1
Calcium nitrate (nitrate of lime)	1	1	1	1	1	1	1	1	2	1		1	1
Calcium phosphate (aqueous solution)	1	1	1	1	1	1	4	4	1	1		1	1
Calcium salts	1	1	1	1	1	1	1	1	2	1		1	1
Calcium silicate	1	1	1	1	1	1						1	1
Calcium sulfide	2	1	1	1	1	1	1	4	1	1		1	1
Calcium sulfide (aqueous solution)	2	1	1	1	1	1	1	4	2	1	1	1	1
Calcium sulfite	2	1	1	1	1	1	1	4	1	1		1	1
Calcium thiosulfate	2	1	1	2	2	1	1	4	1	1		1	1
Calgon (sodium metaphosphate)	1	1	1	1	1	2				1		1	1
Calgonite lye (0.2%), 100°C	4			4		4	4		3				
Caliche solution (Chile saltpetre)	1	1	1	1	1	1	1	1	2	1		1	1
Camphor oil	4	4	4	1	1	4	4	4	4	4		1	1
Cane sugar liquid	1	1	1	1	1	1	4	4	1	1		1	1
Canola oil	4	1	1	2	2	2	2	2	4	1		1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Caprylaldehyde (Hexanal)	2	2	2				4	4	4	2		4	1
Carbamate	4	2	2	3	2	2	4	4		1		1	1
Carbitol (ethyl diglycol)	2	2	2	2	2	2	4	4	2	2		2	1
Carbolic acid (phenol)	4	2	2	4	4	3	3	4	4	1		1	1
Carbon dioxide	2	2	2	1		2	1		2	1		1	1
Carbon dioxide, dry	1	1	1	1	1	1	1	1	1	1		1	1
Carbon dioxide, room temp.	2	2	2	2	2	1	1		2	1		1	1
Carbon dioxide, wet	1	1	1	1	1	1	4	4	1	1		1	1
Carbon disulfide (carbon disulfide)	4	4	4	3		4		3	4	1	1	1	1
Carbon disulfide, 20°C	4			4		4	2		4				
Carbon disulfide, room temp.	4	4	4	4	4	4	4	4	4	1	1	1	1
Carbon monoxide	2	1	1	1	2	2	1	1	1	2		1	1
Carbon monoxide, dry	1	1	1	1	1	1	1	1	1	1		1	1
Carbon tar (creosote)	4	4	4	1		2	3	1	4	1		1	
Carbon tetrachloride	4	4	4	3		4	4	4	4	3	4	1	2
Carbon tetrachloride, 20°C	4			4		4	4		4				
Carbon tetrachloride, room temp.	4	4	4	4	4	4	4	4	4	3	4	1	1
Carbonic acid	1	1	1	1	1	1	4	4	1	1		1	1
Castor oil	1	2	2	1	1	1	1	1	1	1		1	1
Castor oil (Castor oil)	1	2	2	1	2	1	1	1	1	1	1	1	1
Castrol engine oil 20 W/20 HD, 100°C	4			3		2	4		2				
Cattle feed oil	4	2	2	1		4	1	1	2	1		1	1
Caustic soda solution, alkali solution	1	1	1	2	2	2	4	4	2	2		2	1
Cellosolve (ethylene glycol ether)	4	2	2	4	4	4	4	4	4	4		3	1
Cellosolve acetate (glycol acetate)	4	2	2	4	4	4	4	4	4	4		4	1
Cellosolve, butyl	4	2	2	4	4	4	4	4	4	4		4	1
Celluguard	1	1	1	1	1	1	4	3	1	1		1	1
Cellulube (Fyrquel)	4	1	1	4	4	4	4	4	1	3		1	
Cellulube 90, 100, 150, 220, 300, 500	4	1	1	4	4	4	4	4	1	2		1	1
Cellutherm 2505A	4	4	4	2	2	4	4	2	4	2		1	1
Cetane (Hexadecane)	4	4	4	1	1	2	4	1	4	3		1	1
Chemical cleaning liquid, room temp.	4	4	4	4	4	3	4	4	4	2		1	1
China wood oil (China tung oil)	4	3	3	1		2	3		4	2		1	1
Chlorax	4	2	2	2	2	2	4	4		1		1	1
Chlordane	4	4	4	2	2	3			4	2		1	1
Chlorinated carbonic acid ethyl ester	4	4	4	4	4	4	4	4	4	2		1	1
Chlorinated hydrocarbons, 20°C	4			4		4	4		4				
Chlorinated potassium, potash	1	1	1	1	1	1	1	1	1	1		1	1
Chlorine dioxide	4	3	3	4	3	4	4	4		2		1	1
Chlorine dioxide, 8% Cl as NaClO2 in solution	4	4	4	4	4	4	4	4		2		1	1
Chlorine gas, dry	4	3	3	4	4	4	4	4	4	2		1	1
Chlorine gas, moist	4	3	3	4	4	4	4	4	4	3		1	1
Chlorine trifluoride	4	4	4	4	4	4	4	4	4	3		4	2
Chlorine, dry	4	4	4	4	2	3	4	4	4	1		1	1
Chlorine, wet	4	3	3	4	3	3	4	4	4	2		2	1
Chlorine-containing (salty) seawater	2	4	4	4	4	4	4	4	4	1		1	1
Chlorine-containing solvents, dry	4	4	4	4	4	4	4	4	4	1		1	1
Chlorine-containing solvents, wet	4	4	4	4	4	4	4	4	4	1		1	1
Chloroacetic acid	4	2	1	4	1	4	4	4		4		4	1
Chloroacetic acid ethyl ester	4	4	4	4	4	4	4	4	4	2		1	1
Chloroacetone	4	2	1	4	3	3	4	4	4	4		4	1
Chlorobenzene	4	4	4	4	4	4	4	4	4	2		1	1
Chlorobenzene, 50°C	4			4		4	4		4				
Chlorobromomethane	4	2	2	4	4	4	4	4	4	2		1	1
Chlorobutadiene (chloroprene), room temp.	4	4	4	4	4	4	4	4	4	2		1	1
Chlorodecane	4	4	4	4	4	4	4	4	4	1		1	1
Chlorododecane	4	4	4	4	4	4	4	4	4	1		1	1
Chloroethane, room temp.	4	4	3	4	4	1	2	4	4	1		1	1
Chloroethene, room temp.	4	3	3	4	4	4	4	4	4	3		1	1
Chloroform (trichloromethane)	4	4	4	4	4	4	4	4	4	4	4	1	1
Chloromethane, room temp	4	3	3	4	4	4	4	4	4	2		1	1
Chloronaphthalene-1.1-, room temp.	4	4	4	4	4	4	4	4	4	4		4	1
Chloronaphthalene-1.2-, room temp.	4	4	4	4	4	4	4	4	4	2		1	1
Chlorophenol (o-chlorophenol)	4	4	4	4	4	4	4	4	4	3		1	1
Chloroprene (chlorobutadiene)	4	4	4	4	4	4	4	4	4	2		1	1
Chloroprene, 0°C	4			4		4	4		4				

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Chloroprene, 20°C	4			4		4	4			4			
Chloropropane-(2), room temp.	4	4	4	4	4	4	4	4	4	2		1	1
Chlororextol	4	4	4	2	2	2	4	2	4	2		1	1
Chlorosulfonic acid, 10%	4	4	4	4	4	4	4	4	4	4		4	1
Chlorosulfonic acid, room temp.	4	4	4	4	4	4	4	4	4	4	1	4	1
Chlorosulfur	4	4	4	4	4	4	4	4	3	1		1	1
Chlorosulfuric acid (chlorosulfonic acid)	4	4	4	4		4	4	4	4	4	1	4	
Chlorotoluene	4	4	4	4	4	4	4	4	4	2		1	1
Chlorox (sodium hypochlorite)	4	2	2	2	2	1	4	4	2	2		1	1
Chrome plating solution	4	2	2	4		4	4	4	2	2		1	1
Chromic acid	4	3	3	4	2	3	4	4	3	3	1	1	1
Chromic acid, 50 %	4	3	2	4	4	4	4	4	3	3		1	1
Chromium alum	1	1	1	1	1	1	1	4	1			1	1
Chromium baths, room temp.	4	2	2	3	4	4	3	4	2	2		1	1
Chromium oxide 88 wt.% (aqueous solution)	4	2	2	4	4	4	4	4	2	2		1	1
Circo Light Process Oil	4	4	4	1	1	2	1	1	4	1		1	1
Citric acid	1	1	1	1	1	1	1		1	1	1	1	1
Citric acid, room temp.	1	1	1	1	1	1	1		1	1	1	1	1
City Service Koomotor-Aplar, oil 140-E.P.Lube	4	4	4	1	1	2	1	1	4	1		1	1
City Service No. 65, 120, 250	4	4	4	1	1	2	2	1	4	1		1	1
City Service Pacemaker No. 2	4	4	4	1	1	2	2	1	4	1		1	1
Claw oil	4	2	2	1	1	4	1	1	2	1		1	1
Coal tar (tar oil), room temp.	4	4	4	2	4	1	3	1	4	1		1	1
Cobalt chloride (aqueous solution)	1	1	1	1	1	1	4	4	1	1		1	1
Cobalt chloride, 2n	1	1	1	1	1	1	4	4	1	1		1	1
Cobalt dichloride (aqueous solution)	1	1	1	1	1	1	4	4	2	1		1	1
Coconut oil			4	1	1				1			1	1
Coconut oil	4	3	3	1	3	2	2	1	1	1		1	1
Cod liver oil	4	1	1	1		2	1	1	2	1		1	1
Cod liver oil	4	4	4	1	1	1	1	1	1	1		1	1
Cod liver oil, room temp.	4	1	1	2	2	1	1	1	2	1		1	1
Coffee	3	1	1	1	1	1	4	4	1	1		1	1
Coke oven gas	4	4	4	4	3	4	4	4	2	2		1	1
Cola Essence (Coca-Cola)			1	3	3				1	2		4	1
Colamin (ethanolamine)	2	2	2	4	4	4	4	4	2	4		4	1
Common salt (aqueous solution)	1	1	1	1	1	1	4	4	1	1		1	1
Compressed air supply	4	1	4	1	1	1	1	4	4	4		1	1
Convelex 10	4	4		4	4	4	2		4				1
Coolanol (Monsanto), silicone oil	4	4	4	1	1	1	4	4	4	2		1	1
Coolanol 45 (Monsanto)	4	4	4	1	1	1	4	4	4	2		1	1
Copper acetate (aqueous solution)	1	1	1	2	2	2	4	4	4	4		4	1
Copper chloride (aqueous solution)	1	1	1	1	2	2	1	1	1	1		1	1
Copper cyanide (aqueous solution)	1	1	1	1	1	1	1	1	1	1		1	1
Copper lime broth, room temp.	2	1	1	2	1	2	4	4	2	2		1	1
Copper lime mixture (Bordeaux Mixture)	2	1	1	2	2	2	4	4	2	2		1	1
Copper salts	1	1	1	1	1	1	1	1	1	1		1	1
Copper sulfate (aqueous solution)	1	1	1	1	1	1	4	4	1	1		1	1
Corn oil	4	4	4	1	1	3	2	1	1	1		1	1
Cottonseed oil	4	1	3	1	1	4	2	1	4			1	1
Cottonseed oil	4	3	2	1	2	2	1	1	1	1	1	1	1
Creole acid	4	4	4	4		3	4	4	4	2	1	1	1
Creosol (methyl pyrocatechol)	4	4	4	4	4	4	4	4	4	2		1	1
Creosote coal tar	4	4	4	1	1	2	3	1	4	1		1	1
Creosylic acid	4	4	4	4	4	4	4	4	4	2		1	1
Cresol (methylphenol)	4	4	4	4	4	3	4	4	4	2	1	1	1
Cresylic acid, room temp.	4	4	4	3	4	4	4	4	4	2	1	1	1
Cumene (isopropylbenzene)	4	4	4	4	4	4	4	4	4	2		1	1
Cutting grease	4	4	4	1	1	2	1	1	4	1		1	1
Cyclohexane (hexamethylene)	4	4	4	1	4	3	1	1	4	2	2	1	1
Cyclohexane, 50°C	4			2		4	1		4				
Cyclohexanol (hexahydrophenol, anol)	4	4	3	3	2	1			4	1		1	1
Cyclohexanone (pimelin ketone, anone)	4	2	2	4	4	4	4	4	4	4	2	4	1
Decalin (decahydronaphthalene)	4	4	4	4	4	4			4	1		1	1
Decane	4	4	4	1	3	4	2	1	2	1		1	1
Delco brake fluid		2	1	3	3	2			3	4		4	1
Desmodur T 80, 70°C	4			4		4	4		3				

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Desmophen 2200, 70°C	3			1		1	3		1				
Desmophen 3800, 70°C	4			1		1	1		1				
Detergent solution (synthetic surfactant)	2	1	1	1		2	4	4	1	1		1	1
Deteriorated alcohol	1	1	1	1	1	1	4	4	1	1		1	1
Developing liquid (photography)	1	2	2	1	1	1			1	1		1	1
Dexron (ATF oil)	4	4	4	1	1	2	2	1	4	2		1	1
Diacetone	4	1	1	4	4	4	4	4	4	4		4	1
Diacetone alcohol (diacetol)	4	1	1	4	2	2	4	4	2	4		4	1
Diazinon (insecticide)	4	4	4	3	3	3			4	2		2	1
Dibenzyl ether	4	2	2	4	4	3	2					4	1
Dibenzyl sebacate	4	2	2	4	4	4	2	4	3	3		2	1
Dibromodifluoromethane	4	2	2	4	4	4	4	4	4				1
Dibromoethylbenzene	4	4	4	4	4	4	4	4	4	2		2	1
Dibutyl ether	4	3	3	4	4	3	2	3	4	3		3	1
Dibutyl phthalate (DBP)	4	3	2	4	4	4	3	4	2	3		3	1
Dibutyl phthalate (Palatinol C)	4	3	2	4	4	4	4	4		3		4	1
Dibutyl sebacate (DBS)	4	2	2	4	4	4	4	4	2	2		2	1
Dibutylamine	4	4	3	4	4	4	4	4	3	4		4	1
Dichlorobenzene-1.2-, room temp.	4	4	4	4	4	4	4	4	4	2	1	1	1
Dichlorobutane (tetramethylene chloride)	4	4	4	2	2	4	4	4	4	2		1	1
Dichloroethylene, room temp.	4	3	3	4	4	4	4	4	4	3	2	1	1
Dichloroisopropyl ether	4	4	3	4	4	4	2	3	4	3		3	1
Dichloromethane (methylene chloride, room temp.)	4	4	3	4	4	4	4	4	4	2	2	2	1
Dicyclohexylamine	4	4	4	3	4	4	4	4	4	4		4	1
Diesel fuel	4	4	4	1	1	4	3	1	4	1		1	1
Diesel oil	4	4	4	1	3	3	3	1	4	1	2	1	1
Diester Synth. lubricant (MIL-L-7808)	4	4	4	2	2	4	4	2	4	2		1	1
Diethyl sebacate	4	2	2	2	2	4	4	4	2	2		2	1
Diethylamine	2	2	2	2	3	2	3	4	2	4		4	1
Diethylamine, 20°C	4			4			4		4				
Diethylbenzene	4	4	4	4	4	4	4	4	4	3		1	1
Diethylene ether, 20°C	4			3		3	2		4				
Diethylene ether, room temp.	4	4	4	3	3	4	1	3	4	3		4	1
Diethylene glycol (digol)	1	1	1	1	1	1	4	2	2	1		1	1
Diethylene glycol, 100°C	4			3		2	4		1				
Diethylene glycol, 50°C	1			1		1	2		1				
Difluorodibromomethane	4	2	2	4	4	4	4	4	4				
Diisobutyl ketone	3	1	1	4	4	4	4	4	4	4		4	1
Diisobutylene (isooctene)	4	4	4	2	4	4	4	4	4	3		1	1
Diisooctyl sebacate	4	4	3	3	3	4	4	4	3	3		2	1
Diisopropyl ketone	4	1	1	4	4	4	4	4	4	4		4	3
Diisopropylbenzene	4	4	4	4	4	4				2		1	
Diisopropylidene acetone (phorone)	4	3	3	4	4	4	4	4	4	4		4	
2,2-dimethylbutane	4	4	4	1	1	2	4	1	4	1		1	1
2,3-dimethylbutane	4	4	4	1	1	2	4	1	4	1		1	1
2,4-dimethylpentane	4	4	4	1	1	2	4	1	4	3		1	1
Dimethyl ether (methyl ether)	4	4	4	1	3	3			4	1		4	1
Dimethyl phthalate (DMP)	4	2	2	4	4	4			4	2		2	1
Dimethylaniline (xylydine, aminoxylyene)	3	3	2	3	4	3	4	4	4	4		4	1
Dimethylformamide (DMF)	4	2	2	2	4	3	4	4	2	4	1	4	1
Dimethylhydrazine, unsym. (UDMH, room temp.)	1	1	1	2	1	2			4	4		4	1
Dinitrogen tetraoxide, room temp.	4	3	3	4	4	4	4	4	4	4		4	2
Dinitrotoluene (DNT)	4	4	4	4	4	4	4	4	4	4		4	1
Diocetyl phthalate (DOP)	4	2	2	3	4	4	4	4	3	2		2	1
Diocetyl sebacate (DOS)	4	2	2	4	4	4	2	4	3	3	1	2	1
Dioxane	4	2	2	4	4	4	4	4	4	3	4	4	1
Dioxane-1.4-, 20°C	4			4		4	4		3				
Dioxane-1.4-, 80°C	4			4		4	4		4				
Dioxolane (glycol methyl ether)	4	3	2	4	4	4	4	4	4	4		4	1
Dipentene (paint solvent)	4	4	4	2	4	4	4	4	4	3		1	1
Diphenyl (biphenyl, phenylbenzene)	4	4	4	4		4	4	4	4	2	2	1	1
Diphenyl ether	4	4	4	4	4	4	4	4	3	2		1	1
Diphenyl oxide	4	4	4	4	4	4	4	4	3	2	2	1	1
Diphyl, room temp.	4			4		4			2				
Dodecyl alcohol	1	1	1	1	1	1	4	4	2	2		1	1
Dow Chemical 50-4		2	1			2				4		1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Dow Chemical ET588		2	1	3	3	2				4		4	1
Dow Corning-11	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-1208	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-200	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-220	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-3	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-33	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-4	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-4050	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-44	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-5	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-510	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-55	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-550	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-6620	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-704		1	1	2	2							1	1
Dow Corning-705		1	1	2	2							1	1
Dow Corning-710	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-F60	1	1	1	1	1	1	1	1	3	1		1	1
Dow Corning-F61	1	1	1	1	1	1	1	1	2	1		1	1
Dow Corning-XF60	1	1	1	1	1	1	1	1	3	1		1	1
Dow Guard	1	1	1	1	1	1	3	3	3	1		1	1
Dowtehrm A, heat transfer oil	4	4	4	4	4	4	4	4	4	2		1	1
Dowtehrm E, heat transfer oil	4	4	4	4	4	4	4	4	4	2		1	1
Dowtherm , 209, 50% solution		2	1	3	3	2			3			4	1
Dowtherm oil	4	4	4	4	4	4	3	4	3	2		1	1
Ducor (paint thinner)	4	4	4	4	4	4	4	4	4	2		2	1
Elaol CA 9031, 80°C	4			4	4	4	4	4	2				
Elaol FR, 80°C	4			4	4	4	4	4	1				
Elco 28-EP Lubricant	4	4	4	1	1	3	1	1	2	1		1	1
Electroplating baths for chrome	4	1	1						4			1	1
Electroplating baths, other metals		1	1	1	1				4			1	1
Electroplating solution for chrome	4	1	1			4			4			1	1
Electroplating solution for other metals	4	1	1	1		4			4			1	1
Epichlorohydrin	4	4	3	4	4	4	4	4	4	4		4	1
Epoxy resins		1	1			1						4	1
Esam-6 Fluid		2	1	1		2				4		4	1
Esso Cazar K 2, 50°C	4			2		4	1		2				
Esso Engine Oil	4	4	4	1	1	3	4	1	4	1		1	1
Esso Fuel 208	4	4	4	1	1	2	4	1	4	1		1	1
Esso Gear Oil (Type A)	4	4	4	1	1	2	3	1	4	1		1	1
Esso Golden Gasoline	4	4	4	2	2	4	4	4	4	1		1	1
Esso Norva 275, 100°C	4			3		2	4		1				
Esso Univas No. 40 (hydraulic oil)	4	4	4	1	1	2	1	1	4	1		1	1
Esso WS2812 (Mil-L-7808A)	4	4	4	1	1	4	4	2	4	1		1	1
Esso XP90-EP Lubricat	4	4	4	1	1	2	1	1	4	1		1	1
Esstic 42, 43	4	4	4	1	1	2	2	1	4	1		1	1
Ethanol, 50°C	1			3		1	3		2				
Ethane	4	4	4	1	2	2	3	1	4	2		1	1
Ethanol, room temp.	1	1	1	1	1	1	4	4	1	1	1	1	1
Ethanolamine (aminoethanol) (MEA)	2	2	2	2	3	2	3	4	2	4	1	4	1
Ethanolamines, room temp.	2	2	1	4	4	4	4	4	2	4		4	4
Etheric oils, room temp.	4	4	4	3	2	2	3		4	2		1	1
Ethers (various)	4	4	3	4	4	4	2	3	4	3		3	1
Ethylchloroformic acid ester, room temp.	4	3	2	4	4	4	4	4	4	4		4	1
2-ethyl-1-hexanol (isooctanol)	1	1	1	1	1	1	4	4	2	1		1	1
Ethyl acetate (ethyl acetate)	4	2	2	4	4	3	4	4	2	4	4	4	1
Ethyl acetate, 20°C	4			4		4	4		4				
Ethyl acetoacetate	3	2	2	4	4	3	4	4	2	4		4	1
Ethyl acrylate, room temp.	4	2	2	4	4	4	4	4	2	4		4	1
Ethyl acrylic acid	4	2	2	4	4	2	4	4	4	4			
Ethyl alcohol (ethanol)	1	1	1	1	1	1	4	4	1	1	1	2	1
Ethyl benzoate	4	4	4	4	4	4	4	4	4	1	3	1	1
Ethyl bromide	4	4	4	2	2	4	4	4	4	1		1	1
Ethyl cellosolve (glycol diethyl ether)	4	4	4	4	4	4	4	4	4	4		4	1
Ethyl cellulose	2	2	2	2	2	2	2	4	3	4		4	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Ethyl chloride (chloroethane)	4	4	3	1		4	2	4	4	1		1	1
Ethyl chlorocarbonate	4	3	2	4		4	4	4	4	2		1	1
Ethyl chlorocarbonate, room temp.	4	3	2	4	4	4	4	4	4	2		1	1
Ethyl chloroformate	4	3	2	4		4	4	4	4	4		4	
Ethyl ether (diethyl ether)	4	3	3	3		3	3	4	4	3		4	1
Ethyl formate (formic acid ethyl ester)	4	2	2	4	2	2				1		1	2
Ethyl mercaptan (ethanethiol)	4	4	3	4	4	3			3			2	1
Ethyl oxalate	4	4	4	4	4	4		4	4	2		1	1
Ethyl pentachlorobenzene	4	4	4	4	4	4	4	4	4	2		1	1
Ethyl silicate	2	1	1	1	1	1				1		1	1
Ethylbenzene	4	4	4	4	4	4	4	4	4	1	2	1	1
Ethylcyclopentane	4	4	4	1	1	3	1	2	4	1		1	1
Ethylene (ethene)	4	4	4	1	1	4	2	2	4	1		1	1
Ethylene chloride	4	3	3	4		4	4	4	4	3		2	1
Ethylene chloride, 20°C	4			4		4	4		4				
Ethylene chloride, 50°C	4			4		4	4		4				
Ethylene chlorohydrin	2	2	2	4	2	2	4	4	3	2	1	1	1
Ethylene diamine	1	1	1	1	2	1	4	4	1	4		4	2
Ethylene dibromide	4	3	3	4	4	4	4	4	4	3		1	1
Ethylene dichloride (1,2-dichloroethane)	4	3	3	4	4	4	4	4	4	3	2	1	1
Ethylene glycol (glycol)	1	1	1	1	1	1	4	3	1	1		1	2
Ethylene glycol, 100°C	1			1		1	1		1				
Ethylene glycol, 50°C	1			1		1	3		1				
Ethylene oxide (12%) and Freon 12 (80%)	4	2	2	3	3	4	4	4	4	4		4	
Ethylene oxide (oxirane, epoxy)	4	3	3	4	4	4	4	4	4	4		4	1
Ethylene trichloride	4	3	3	4		4	4	4	4	3		1	1
F-60 Fluid (Dow Corning)	1	1	1	1	1	1	1	1	4	1		1	1
F-61 Fluid (Dow Corning)	1	1	1	1	1	1	1	1	4	1		1	1
Fatty acids	4	3	3	2	2	2			3			1	1
FC43 Heptacosofluorotri-butylamine		1	1	1	1	1			1	1		1	
FC75		1	1	1	1	1			1	2		2	
Ferric chloride	1	1	1	1	1	2	1	1	2	1		1	1
Ferric nitrate	1	1	1	1	1	1	1	1	2	1		1	1
Ferric sulfate (aqueous solution)	1	1	1	1	1	1	1	1	2	1		1	1
Ferrous sulfate (aqueous solution)	1	1	1	1	1	1	4	4	1	1		1	1
Fewa lye (2%), 100°C	4			4		4	4		3				
Fish oil (fish oil)	4	4	4	1		4			1	1		1	1
Fixing salt	1	1	1	1	1	1	4	4	1	1		1	1
Fluisil S 25, 80°C	4			2		1	4		4				
Fluorescent gas (aromatics-free)	4	4	4	1	1	3	1	1	3	2		1	1
Fluorescent gas, room temp.	3			1		1	1		1				
Fluorinated cyclic ethers, room temp.	4	1	1	4									2
Fluorine (liquid)	4	4	4	4		4	4	4	4			2	2
Fluorobenzene	4	4	4	4		4	4	4	4	2		1	1
Fluoroboric acid	1	1	1	1	1	1							1
Fluorocarbon oils, room temp.	2	1	1	2									2
Fluorolube	2	1	1	1	1	2			1	2		2	2
Fluorosilicic acid (hydrofluorosilicic acid), room temp.	2	2	2	2	2	1			4	4		1	1
Formaldehyde (RT) (methanal)	2	2	2	3	3	3	4	4	2	4	1	4	1
Formic acid (methanoic acid)	2	1	1	2	1	1	3		2	3	2	3	2
Formic acid methyl ester	4	2	2	4	4	2						4	1
Freon 11 (trichlorofluoromethane)	4	4	4	2	2	4	4		4	2		2	4
Freon 112	4	4	4	2	2	2			4			1	2
Freon 113 (trichlorotrifluoroethane)	3	4	3	1	1	1	2		4	4		3	3
Freon 114 (dichlorotetrafluoroethane)	1	1	1	1	1	1	1		4	2		2	3
Freon 114B2	4	4	4	2	2	1			4			2	4
Freon 115 (chloropentafluoroethane)	1	1	1	1	1	1						1	4
Freon 12 & ASTM Oil No. 2 (50/50)	4	4	4	1	1	2			4	2		1	3
Freon 12 & Suniso 4G (50/50)	4	4	4	1	1	2			4	2		1	3
Freon 12 (Dichlorodifluoromethane)	2	2	2	1	1	1	1	1	4	3		2	2
Freon 13 (chlorotrifluoromethane)	1	1	1	1	1	1			4	4		2	1
Freon 134A			1	2	1	1						4	
Freon 13B1	1	1	1	1	1	1	1		4			2	2
Freon 14	1	1	1	1	1	1	1		4			1	4
Freon 142b (difluorochloroethane)	2	1	2	1	1	1						4	3
Freon 152	1	1	1	1	3	1						4	2

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Freon 152a (difluoroethane)	1	1	1	1		1						4	3
Freon 21 (dichlorofluoromethane)	4	4	4	4	4	2			4			4	2
Freon 218	1	1	1	1	1	1						2	
Freon 22 & ASTM Oil No. 2 (50/50)	4	4	4	4	4	2		2	4	2		2	2
Freon 22 (chlorodifluoromethane)	2	1	1	4	1	1	4	2	4	4		4	2
Freon 31	2	1	1	4	2	2						4	2
Freon 32	1	1	1	1	1	1						4	2
Freon 502	1	1	1	2	2	1						4	3
Freon BF	4	4	4	2	2	2			4			1	2
Freon C316	1	1	1	1	1	1						2	2
Freon C318 (octafluorotetraethylene)	1	1	1	1	1	1						2	3
Freon K-142B	2	1	1	1	1	1						4	
Freon K-152A	1	1	1	1	1	1						4	
Freon MF	4	4	4	1	2	3	3		4			2	
Freon PCA	4	4	4	1	1	1	1		4			2	
Freon TA	3	2	2	1	1	2	1		3			4	3
Freon TC	4	2	2	1	1	1	1		4			2	2
Freon TF	4	4	4	1	1	1	1		4		4	2	3
Freon TMC	4	3	3	2	2	3	2		3			2	2
Freon T-P35	1	1	1	1	1	1	1		1			2	2
Freon T-WD602	4	2	2	2	2	2	1		4			2	2
Frigen F11, 20°C	4			4		4	3		4				
Frigen F12, 20°C	4			3		3	2		4				
Fuel oil	4	4	4	1		2	2	1	4	1		1	
Fuel oil, acidic	4	4	4	1	1	2	2	1	1	1		1	1
Fuel oil, heavy (hard coal)	4	4	4	3	3	4	3	1	3	1		1	1
Fuel oil, light	4	4	4	1	1	3	3	1	3	1		1	1
Fuel oil, No. 6	4	4	4	2	2	4	2	1	1	1		1	1
Fumaric acid	3	2	2	1	2	2		4	2	1		1	1
Furan	4	4	3	4	4	4		4				4	1
Furfural (Furfurol)	4	2	2	4	4	4	3	4	4		2	4	1
Furfuryl alcohol	4	2	2	4	4	4	4	4	4	4			1
Furylcarbinol	4	2	2	4	4	4	4	4	4	4			1
Fyrquel (Cellulube)	4	1	1	4		4	4	4	1	3		1	
Fyrquel 90, 100, 150, 220, 300, 500	4	1	1	4	4	4	4	4	1	2		1	1
Fyrquel A60	4	2	2	4	4	4	4	4	3	4		4	1
Gallic acid	1	2	2	2	2	2	4	4		1		1	1
Gallic tannic acid, 10%	1	1	1	1	1	1		4	2			1	1
Gallic tannic acid, tannin	1	1	1	1	1	2		4	2			1	1
Gasoline (nitrobenzene, ligroin)	4	4	4	2	2	2	2	1	4	1		1	1
Gasoline, room temp.	4	4	4	3	3	2	2	4	4	1	2	1	1
Gear oil type A	4	4	4	1	1	2	1	1	2	1		1	1
Gelatine	1	1	1	1	1	1	4	4	1	1		1	1
Generator gas	4	4	4	1	1	2	1	2	2	2		1	1
Girling Bresm fluid		2	1	3	3	2				4		4	1
Glacial acetic acid (conc.) pure, 100°C	4			4		4	4		4				
Glacial acetic acid (conc.) pure, 50°C	4			4		4	4		2				
Glauber's salt (aqueous solution)	2	2	2	4	2	2		4		1		1	1
Glauber's salt (sodium sulphate)	2	2	2	4	4	2		4		1		1	1
Glucose (dextrose, grape sugar)	1	1	1	1	1	1	4		1	1		1	1
Glue (DIN 16920)	2	2	1	1		1	1		1	1		1	
Glycerin (glycerol, oil sweet; E422)	1	1	1	1	1	1	1	3	1	1	1	1	1
Glycerin, 100°C	4			1		1	1		4				
Glycerol triacetate	2	1	1	2	2	2	4	4		4		4	1
Glycerol, 50°C	1			1		1	1		1				
Glycol (1,2-diol)	1	1	1	1	1	1	4	4	1	1		1	2
Green sulfate broth	2	1	1	2		2	1	2	1	2		1	2
Gulf Crown Grease	4	4	4	1	1	2	1	1	4	1		1	1
Gulf Endurance Oils	4	4	4	1	1	2	1	1	4	1		1	1
Gulf FR Fluids (Emulsion)	4	4	4	1	1	2	1	1	4	1		1	1
Gulf FR G-Fluids	4	4	1	1	1	1	2	4	1	1		1	1
Gulf FR P-Fluids	4	2	2	4	4	4	4	4	1	2		2	1
Gulf Harmony Oils	4	4	4	1	1	2	1	1	4	1		1	1
Gulf High Temperature Grease	4	4	4	1	1	2	1	1	4	1		1	1
Gulf Legion Oils	4	4	4	1	1	2	1	1	4	1		1	1
Gulf Paramount Oils	4	4	4	1	1	2	2	1	4	1		1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Gulf Security Oils	4	4	4	1	1	2	2	1	4	1		1	1
Halon 1301	1	1	1	1	1	1			4	2		1	1
Halothane (Narcotic)	4	4	4	4	4	4	4	4	4	2		1	1
Halowax Oil	4	4	4	4	4	4			4	1		1	2
Hannifin, Parker-O-Lube	4	4	4	1	1	1	1	1	2	1		1	1
HEF-2 (High Energy Fuel)	4	4	4	2	2	4	4	4	4	2		1	1
Helium	1	1	1	1	1	1	1	1	1	1		1	1
Heptane (N-heptane)	4	4	4	1	1	3	1	1	4	1		1	1
Hex-1-en-n-, room temp.	4	4	4	2	2	2	2	1	4	1		1	1
Hexafluorosilicic acid	2	2	2	1		2			4	4		1	1
Hexanaldehyde-n-, room temp.	4	2	1	1	3	4	2		2	4		4	1
Hexane	4	4	4	1	2	2	2	1	4	1		1	1
Hexanol	2	3	3	1	2	2	4	4	2	2		1	1
Hexanon-(2), (propylacetone), room temp.	4	1	1	4	4	4	4	4	3	4		4	1
Hexyl alcohol	1	3	3	1	1	3	4	4	3	1		1	1
High Viscosity Lubricant H2		1	1	1	1	2	4	4	1	2		1	1
High Viscosity Lubricant H4		1	1	1	1	2	4	4	1	2		1	1
Hilo MS No. 1	4	2	1	4	4	4	4	4	3	3		4	1
Houghto-Safe 1010 (phosphate ester)	4	1	1	4	4	4		4	3	2		1	1
Houghto-Safe 1055 (phosphate ester)	4	1	1	4	4	4		4	3	2		1	1
Houghto-Safe 1120 (phosphate ester)	4	1	1	4	4	4	4	4	3	2		1	1
Houghto-Safe 271 (water/glycol base), HFC		2	1	1	1	2	4	4	2	2		2	1
Houghto-Safe 5040 (water/oil emulsion)	4	4	4	1	1	2	4	4	3	2		1	1
Houghto-Safe 620 (water/glycol base), HFC		2	1	1	1	2	4	4	2	2		2	1
Hydraulic oil (petroleum), room temp.	4	4	4	2	2	1	1	1	3	1		1	1
Hydraulic oil H 515 (Shell), 100°C	4			2		4	2		4				
Hydraulic oils (mineral oil based)	4	4	4	1	1	2	1	1	3	1		1	1
Hydrazine (diamide, diazane)	1	1	1	2	2	2	4		3	4		4	2
Hydrobromic acid	1	1	1	4	1	4	4	4	4	3		1	1
Hydrobromic acid (40%)	1	1	1	4	1	2	4	4	4	3		1	1
Hydrobromic acid (aqueous solution)	3	1	1	4	4	3	4	4	4	4		1	1
Hydrocarbons (saturated)	4	4	4	1	1	2	2	1	4	1		1	1
Hydrochloric acid (cold) 37	2	1	1	3	1	2	4	4	3	2	1	1	1
Hydrochloric acid (hot) 37%	4	3	3	4	2	4	4	4	4	3	2	2	1
Hydrochloric acid, 3 mol	3	1	1	3	3	3		1	4	2		1	1
Hydrochloric acid, 3-molar	3	1	1	3	3	3		2	4	2		1	1
Hydrochloric acid, concentrated	4	1	3	4	4	4	4	4	4	3		1	1
Hydrochloric acid, concentrated	4	1	3	4	4	4	4	4	4	3		1	1
Hydrocyanic acid	1	1	1	2	2	2		4	3	2		1	1
Hydro-Drive MIH 50 (mineral oil base)	4	4	4	1	1	2	2	1	2	1		1	1
Hydrofluoric acid (hydrofluoric acid), anhydrous	4	1	1	4	4			4		4		4	1
Hydrofluoric acid 65% or less, cold	2	1	1	3	3	1		4	4			1	1
Hydrofluoric acid 65% or less, hot	4	4	4	4	4	3	4	4	4	4		3	1
Hydrofluoric acid 65% or more, cold	4	3	3	4	4	4	4	4	4	4		2	1
Hydrofluoric acid 65% or more, hot	4	4	4	4	4	4	4	4	4	4		3	1
Hydrofluoric acid, anhydrous	4	3	3	4	1	4	4	4	4	4		4	1
Hydrofluoric acid, conc. (cold)	4	3	3	4	1	4	3	4	4	4	1	1	1
Hydrofluoric acid, conc. (hot)	4	4	4	4	3	4	4	4	4	4		4	1
Hydrofluorosilicic acid (fluorosilica), room temp.	2	2	2	2	1	1			4	4		1	1
Hydrogen	1	1	1	1	1	1	1	2	4	4		1	1
Hydrogen bromide, room temp.	4			4		3	4		3				
Hydrogen cyanide	2	1	1	2	1	2		4	3	2		1	1
Hydrogen gas	2	1	1	1	1	1	1	2	3	3		1	1
Hydrogen peroxide, 30% strength	1	1	1	3	3	1	1	4	1	1		1	1
Hydrogen peroxide, 90%	4	4	4	4	4	4	4	4	2	3		2	1
Hydrogen sulfide	4	1	1	4	4	1	4	4	4	4		4	1
Hydrogen sulfide, dry, cold	1	1	1	1	1	1		4	3	3		4	1
Hydrogen sulfide, dry, hot	4	1	1	4	4	2		4	3	3		4	1
Hydrogen sulfide, wet, cold	4	1	1	4	2	2		4	3	3		4	1
Hydrogen sulfide, wet, hot	4	1	1	4	3	3		4	3	3		4	1
Hydrogen, gaseous, cold	2	1	1	1	1	1	1	2	3	3		1	1
Hydrogen, gaseous, hot	2	1	1	1	1	1	1	2	3	3		1	1
Hydrolube (water/ethylene glycol)		2	1	1	1	2	4	4	2	2		1	1
Hydroquinone	3	2	4	3	3	4		4		3		2	1
Hydyn	2	2	1	2	2	2		4	4	4		4	1
Hyjet	4	2	1	4	4	4	4	4				4	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Hyjet III	4	2	1	4	4	4	4	4				4	1
Hyjet IV (replaces III, S, W)	4	2	1	4	4	4	4	4					
Hyjet S	4	2	1	4	4	4	4	4				4	1
Hyjet W	4	2	1	4	4	4	4	4				4	1
Hypochlorous acid	2	2	2	4	4	4		4				1	
Hypochlorous acid	2	2	2	4	4	4		4				1	1
Industron FF44	4	4	4	1	1	2	2	1	4	1		1	1
Industron FF48	4	4	4	1	1	2	2	1	4	1		1	1
Industron FF53	4	4	4	1	1	2	2	1	4	1		1	1
Industron FF80	4	4	4	1	1	2	2	1	4	1		1	1
Iodine		2	2	2	2	4				1		1	1
Iodine pentafluoride	4	4	4	4	4	4	4	4	4	4		4	2
Iodoform (triiodomethane; antiseptic)	4	4	4			4						3	1
i-Propyl acetate	4	2	2	4	4	4	4	4	4	4		4	1
i-Propyl acetate	4	2	2	4	4	4	4	4	4	4		4	1
Iron(III) chloride (aqueous solution)	1	1	1	1	1	1	1	1	2	1		1	1
Iron(III) nitrate (aqueous solution)	1	1	1	1	1	1	1	1	3	1		1	1
Irradiation, room temp.	3	4	2	2	3	3	3	3	3	4		3	1
Isobutanol, room temp.	1	1	1	1	1	2	4	4	1	2		1	1
Isobutyl alcohol (isobutanol)	1	1	1	2		1	4	4	1	2		1	1
Isobutyl n-butyrate	4	1	1	4	4	4		4		1		1	1
Isododecane	4	4	4	1	1	2		4	4	1		1	1
Isooctane	4	4	4	1	2	2	2	1	4	1	2	1	1
Isophorone	4	3	3	4	4	4	3	4	4	4	2	4	1
Isopropanol	1	1	1	2	1	2	3	4	1	2		1	1
Isopropylbenzene	4	4	4	4	4	4	4	4	4	2		1	1
Isopropyl acetate	4	2	2	4	4	4	4	4	4	4		4	1
Isopropyl alcohol (isopropanol)	1	1	1	2		3	4	1	2			1	1
Isopropyl chloride	4	4	4	4	4	4	4	4	4	2		1	1
Isopropyl ether	4	4	4	2		3	2	3	4	3	4	4	1
Isopropyl ether, room temp.	4	4	4	3	3	2	2	3	4	3	4	4	1
JP 3 (Mil-J-5624)	4	4	4	1	1	4	2	2	4	1		1	1
JP 4 (Mil-J-5624)	4	4	4	1	1	4	2	2	4	2		1	1
JP 5 (Mil-J-5624)	4	4	4	1	1	4	2	2	4	2		1	1
JP 6 (Mil-J-25656)	4	4	4	1	1	4	2	2	4	2		1	1
JP X (Mil-F-25604)	4	4	4	1	1	2			4	4		4	1
Kel F liquid		1	1	1	1				2	1		2	1
Kerosene (luminous petroleum; DIN 51636)	4	4	4	1	3	2	1	1	4	1	1	1	1
Kerosene (similar to RP-1 and JP-1)	4	4	4	1	1	4	3	1	4	1		1	1
Kerosene oil (white oil)	4	4	4	1	1	2	1	1	4	1		1	1
Kerosene wax, melted	4	4	4	1	1	1	1	1	1	1		1	1
Keystone No. 87, HC-Grease	4	4	4	1	1	4	1	1	4	1		1	1
Lactam amino acids	4	2	2	4	4	2				4		4	1
Lactams	4	2	2	4	4	2				4		4	1
Lactic acid (cold)	1	1	1	1	1	1		4	1	1		1	1
Lactic acid (hot)	4	4	4	4	3	4		4	2	2		1	1
Lard (animal fat)	4	2	2	1		2	1	1	2	1		1	1
Lard, 50°C	4			1		3	1		1				
Lard, room temp.	4	2	2	2	4	1	1	1	2	1		1	1
Lavender oil	4	4	4	2	4	4	4	2	4	2		1	1
Lead acetate (aqueous solution)	1	1	1	2	4	2	4	4	4	4		4	1
Lead nitrate (aqueous solution)	1	1	1	1	1	1			2	1		1	1
Lead sulfamate (aqueous solution)	2	1	1	2	1	1		4	2	1		1	1
Lead sulfate	2	1	1	2	2	1		4	2	1		1	1
Lehigh X1169	4	4	4	1	1	2	1	1	4	1		1	1
Lehigh X1170	4	4	4	1	1	2	1	1	4	1		1	1
Light lubricant	4	4	4	1	1	4	1	1	4	1		1	1
Light oil (crude benzene)	4	4	4	1	1	2	2	1	4	1		1	1
Ligroin (nitro benzene)	4	4	4	1	3	2	2	1	4	1		1	1
Lime bleach	1	1	1	1	2	2		4	2	1		1	1
Lime sulfur, room temp.	4	1	1	1	1	4		4	1	1		1	1
Lime-sulfur solution	4	1	1	4		1		4	1	1		1	1
Lindol (hydraulic fluid)	4	1	1	4	4	4	4	4	3	3		2	1
Linoleic acid	4	4	4	2	4	4			2			2	1
Linseed oil	4	3	3	1	1	2	2	1	1	1		1	1
Linseed oil, room temp.	4	3	3	2	2	1	2	1	1	1		1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Liquid petroleum gas (LPG)	4	4	4	1	1	2	1	3	3	3		1	1
Liquid petroleum gas (propane, butane, propylene)	4	4	4	1	1	2	1	3	3	3		1	1
Liquimoly	4	4	4	1	1	2	2	1	4	1		1	1
Lubricating oil, petroleum	4	4	4	1	2	2	2	1	4	1		1	1
Lubricating oils, di-ester based	4	4	4	2	2	3		2	4	2		1	1
Lubricating oils, SAE 10, 20, 30, 40, 50	4	4	4	1	1	2	2	1	4	1		1	1
Lye (alkali lye)	2	1	1	2	1	2	4	4	2	1		2	
Magnesium chloride (aqueous solution)	1	1	1	1	1	1	4	4	1	1	1	1	1
Magnesium hydroxide (aqueous solution)	1	1	1	1	1	1	4	4	1	1		1	1
Magnesium salts	1	1	1	1	1	1	1	1	1	1		1	1
Magnesium sulfate (aqueous solution)	2	1	1	1	1	1		4	1	1		1	1
Malathion (insecticide)	4	4	4	2	2				4	2		1	1
Maleic acid (aqueous solution)	1	1	1	1	1	1	4	4	2	2		1	1
Maleic acid (butenedioic acid)	3	2	2	4	4	3		4				1	1
Maleic anhydride (MSA)	3	2	2	4	4	3		4				4	1
Malic acid	3	2	2	1	2	3		4	2	1		1	1
MCS 312	4	4	4	4	4	4		4	1	1		1	1
MCS 352	4	2	1	4	4	4	4	4	3	3		4	1
MCS 463	4	2	1	4	4	4	4	4	3	3		4	1
Mercury	1	1	1	1	1	1	1	1	1	1		1	1
Mercury vapors	1	1	1	1	1	1						1	1
Mercury(II) chloride (aqueous solution)	1	1	1	1	1	1	4	4	2	2		1	1
Mesityl oxide	4	2	2	4	4	4	4	4	4	4	4	4	1
Methacrylic acid methyl ester, 20°C	4					4	4		4				
Methacrylic acid, room temp.	4	2	2	2	4	4	4	4	4	4		4	1
Methane	4	4	4	1	1	3	3	1	4	3		1	1
Methanol	1	1	1	1	1	1	4	4	1	1	1	1	1
Methanol, 50°C	1			3		2	4		1				
2-methylpentane	4	4	4	1	1	2	4	1	4	3		1	1
3-methylpentane	4	4	4	1	1	2	4	1	4	3		1	1
Methyl acetate (methyl acetate)	3	1	1	4	4	2	4	4	4	4		4	1
Methyl acetoacetate		2	2	4	4	4	4	4	4	2		4	1
Methyl acrylate	4	2	2	4	4	2	4	4	4	4		4	1
Methyl acrylic acid	4	2	2	4	4	2	4	4	4	4		3	1
Methyl cellosolve	4	2	2	3	3	3	4	4	4	4		4	1
Methyl cellosolve (methylene glycol ether)	4	2	2	3	2	3	4	4	4	4	1	4	1
Methyl chloride (monochloromethane)	4	3	3	4	4	4	4	4	4	2		2	1
Methyl chloroform	4	4	4	4	4	4	4	4	4	2		1	1
Methyl D-bromide	4			4	4	4	4	4	4	2		1	1
Methyl ether (dimethyl ether)	1	1	1	1	1	3		4	1	1		1	1
Methyl ethyl ketone (MEK)	4	2	1	4	4	3	4	4	4	4	4	4	1
Methyl ethyl ketone (MEK), 20°C	4			4	4	4	4	4	4				
Methyl ethyl ketone (MEK), 50°C	4			4	4	4	4	4	4				
Methyl ethyl ketone peroxide	4	4	4	4	4	4	4	4	2	4		4	1
Methyl formate (formic acid methyl ester)	4	2	2	4	4	2						4	1
Methyl glycol	4	2	2	3	3	3	4	4	4	4		4	
Methyl glycol acetate, 100°C	4			4		4	4		2				
Methyl glycol acetate, 50°C	4			4		4	4		2				
Methyl isobutyl ketone (MIBK)	4	3	3	4	4	4	4	4	4	4	4	4	1
Methyl isopropyl ketone	4	3	3	4	4	4	4	4	4	4		4	1
Methyl methacrylate (MMA)	4	4	4	4	4	4	4	4	4	4		4	1
Methyl oleate	4	2	2	4	4	4				2		2	1
Methyl pentane	4	4	4	4	4	4	4	4	4	2		1	1
Methyl salicylate (methyl salicylic acid ester)	3	2	2	4	4	4					3	2	1
Methylalkohol (Methanol)	1	1	1	1	1	1	4	4	1	1	1	4	1
Methylanilin	4			4	4	4	4	4				2	1
Methylated spirits, room temp.	1	1	1	1	1	1	4	4	1	1		1	1
Methylbenzoat	4	4	4	4	4	4	4	4	4	1		1	1
Methylbromid (Brommethan)	4	4	4	2	2	4		3		1		1	1
Methylbutylketon (Propylacetone)	4	1	1	4	4	4	4	4	3	4		4	1
Methylcyclopentane, room temp.	4	4	4	4	4	4	4	4	4	3		1	1
Methylene chloride (dichloromethane)	4	4	3	4	4	4	4	4	4	2	2	2	1
Methylene chloride, 20°C	4			4		4	4		4				
Mil-A-6091	1	1	1	2	2	1	4	4	1	1		1	1
Mil-C-4339	4	4	4	1	1	4	4	4		1		1	1
Mil-C-7024	4	4	4	1	1	4	1	2	4	1		1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Mil-C-8188	4	4	4	2	2	4	4	3	4	2		2	1
Mil-E-9500	1	1	1	1	1	1	4	4	1	1		1	1
Mil-F-16884	4	4	4	1	1	3	3	1	4	1		1	1
Mil-F-17111	4	4	4	1	1	2	3	1	4	2		1	1
Mil-F-25558 (RJ-1)	4	4	4	1	1	2	1	1	4	1		1	1
Mil-F-25656	4	4	4	1	1	4	2	2	4	2		1	1
Mil-F-5566	1	1	1	2	2	2	4	4	1	1		1	1
Mil-G-10924	4	4	4	1	1	4	1	2	4	1		1	1
Mil-G-15793	4	4	4	1	1	2	1	1	4	2		1	1
Mil-G-21568	1	1	1	1	1	1	1	1		1		1	1
Mil-G-25013	4	4	4	1	1	2	1	1	4	1		1	1
Mil-G-25537	4	4	4	1	1	2	1	2	4	1		1	1
Mil-G-25760	4	4	4	2	2	2	2	2	4	2		1	1
Mil-G-3278	4	4	4	2	2	4	2	1	4	2		1	1
Mil-G-3545	4	4	4	1	1	2	1	1	4	1		1	1
Mil-G-5572	4	4	4	1	1	4	2	2	4	1		1	1
Mil-G-7118	4	4	4	2	2	2	1	1	4	1		1	1
Mil-G-7187	4	4	4	1	1	4	1	1	4	1		1	1
Mil-G-7421	4	4	4	2	2	2	2	4	4	2		1	1
Mil-G-7711	4	4	4	1	1	4	1	2	1	2		1	1
Mil-H-13910	1	1	1	1	1	1	4	4	1	1		1	1
Mil-H-19457	4	1	1	4	4	4	4	4	4	3		2	1
Mil-H-22251		1	1	2	2	2			4				1
Mil-H-27601	4	4	4	1	1	2		1	3	2		1	1
Mil-H-5606	4	4	4	1	1	2	2	2	4	1		1	1
Mil-H-6083	2	4	4	1	1	1	1	1	4	1		1	1
Mil-H-7083	2	1	1	1	1	2	4	4	1	1		2	1
Mil-H-83282	4	4	4	1	1	2	2	2	4	1		1	1
Mil-H-8446 (MLO-8515)	4	4	4	2	2	1	1		4	1		1	1
Mil-J-5161	4	4	4	2	2	4	2	1	4	1		1	1
Mil-J-5624 JP-3, JP-4, JP-5	4	4	4	1	1	4	2	2	4	2		1	1
Milk of lime	1	1	1	1	1	2		4	2	1		1	1
Milk, 3.5% fat (UHT milk)	1	1	1	1	1	1	4	4	1	1		1	1
Mil-L-15016	4	4	4	1	1	2	1	1	4	2		1	1
Mil-L-15017	4	4	4	1	1	2	1	1	4	2		1	1
Mil-L-17331	4	4	4	1	1	2	1	1	4	1		1	1
Mil-L-2104	4	4	4	1	1	2	1	1	4	1		1	1
Mil-L-21260	4	4	4	1	1	2	1	1	4	1		1	1
Mil-L-23699	4	4	4	2	2	3		3	4	2		1	1
Mil-L-25681	2	1	1	2	2	2			4	2		1	1
Mil-L-3150	4	4	4	1	1	2	2	2	4	1		1	1
Mil-L-4343	1	1	1	1	1	1	1	1	3	1		1	1
Mil-L-6081	4	4	4	1	1	2	1	1	4	1		1	1
Mil-L-6082	4	4	4	1	1	2	1	1	1	1		1	1
Mil-L-6085	4	4	4	2	2	4	1	2	4	2		1	1
Mil-L-6387	4	4	4	2	2	4	1	2	4	2		1	1
Mil-L-7808	4	4	4	2	2	4	4	2	4	2		1	1
Mil-L-7870	4	4	4	1	1	2	4	1	4	1		1	1
Mil-L-9000	4	4	4	1	1	2	1	1	4	2		1	1
Mil-L-9236	4	4	4	2	2	4	4	2	4	2		1	1
Mil-O-3503	4	4	4	1	1	2	1	2	4	1		1	1
Mil-P-27402		1	1	2	2	2			4				1
Mil-R-25576 (RP-1) 4	4	4	4	1	1	2	1	1	4	1		1	1
Mil-S-3136, Type I Fuel	4	4	4	1	1	2	1	1	4	1		1	1
Mil-S-3136, Type II Fuel	4	4	4	2	2	4	2	2	4	2		1	1
Mil-S-3136, Type III Fuel	4	4	4	2	2	4	1	2	4	2		1	1
Mil-S-3136, Type IV Oil	4	4	4	1	1	1	1	1	1	1		1	1
Mil-S-81087	1	1	1	1	1	1	1	1	3	1		1	1
Mine gas	4	4	4	1	1	3	3	1	4	3		1	1
Mineral oil	4	3	3	1	2	2	1	1	2	1		1	1
MLO-7277 Hydr.	4	4	4	3	3	4	3	3	4	3		1	1
MLO-7557	4	4	4	3	3	4	3	3	4	3		1	1
MLO-8200 Hydr.	4	4	4	2	2	1	1		4	1		1	1
MLO-8515	4	4	4	2	2	1	1	3	4	1		1	1
Mobil 24 DTE	4	4	4	1	1	2	2	1	4	1		1	1
Mobil Delvac 1100, 1110, 1120, 1130	4	4	4	1	1	2	2	1	4	1		1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Mobil fluid oil F 21 D, 100°C	4			1		4	4		4				
Mobil HF	4	4	4	1	1	2	2	1	4	1		1	1
Mobil Nyvac 20 and 30	1	1	1	1	1	1			1	1		1	1
Mobil Velocite C	4	4	4	1	1	2	2	1	4	1		1	1
Mobilgas WA200 Type A, automatic transmission fluid	4	4	4	1	1	2		1	4	1		1	1
Mobiloil SAE 20	4	4	4	1	1	2	1	1	4	1		1	1
Mobilplex 47, 100°C	4			1		3	4		2				
Mobiltherm 600	4	4	4	1	1	2	2	1	4	1		1	1
Mobilux	4	4	4	1	1	2	2	1	4	1		1	1
Monobromobenzene	4	4	4	4	4	4	4	4	4	2		1	1
Monochlorobenzene	4	4	4	4	4	4	4	4	4	2		1	1
Monoethanolamine	2	2	1	4	4	4	4	4	2	4		4	1
Monomethyl ether	4	4	4	1		3		4	1	1		4	1
Monomethyl hydrazine		1	1	2	2	2			4				1
Monomethylaniline (MMA)	4	2	2	4	4	4	4	4				2	1
Mononitrotoluene	4	4	4	4	4	4	4	4	4	3		3	1
Monovinyl acetylene (vinylethine)	2	2	2	1	1	2			2			1	1
Mustard gas	1	1	1		1	1			1			1	1
n-Amyl alcohol, 100°C	4			4		4	4		4				
n-Amyl alcohol, 50°C	2			3		3	4		3				
Naphtha	4	4	4	2	4	3	2	2	4	2		1	1
Naphthalene (naphthalene)	4	4	4	4	4	4	2		4	1	1	1	1
Naphthalenecarboxylic acid, room temp.	4	4	4	4	4	2			4	1	2	1	1
Naphthenic acid	4	4	4	2		4			4	1	2	1	1
Natural gas	2	4	4	1	1	1	2	2	1	4		1	1
Natural gas, acid													1
n-Butyl benzoate	4	1	1	4	4	4		4		1		1	1
n-Butyl ether	4	3	3	3	3	4	2	4	4	3		4	1
Neon	1	1	1	1	1	1	1	1	1	1		1	1
Neville-Winthors acid	4	2	2	4	4	4		4	4	2		1	1
Nevillic acid	4	2	2	4		4		4	4	2		1	1
n-Hexaldehyde	4	2	1	4		1	2		2	4		4	1
n-hexene-1	4	4	4	2		2	2	1	4	1		1	1
Nickel acetate (aqueous solution)	1	1	1	2	4	2	4	4	4	4		4	1
Nickel chloride (aqueous solution)	1	1	1	1	1	1	3	3	1	1		1	1
Nickel salts	1	1	1	1	1	2	3	3	1	1		1	1
Nickel sulfate (aqueous solution)	2	1	1	1	1	1	3	4	1	1		1	1
Nitric acid (concentrated)	4	4	4	4	2	4	4	4	4	3	2	2	1
Nitric acid (diluted)	4	2	2	4	1	2	3	4	2	2	2	1	1
Nitric acid, 10%	4	1	1	4	4	4	4	4	4	4		1	1
Nitric acid, 65	4	4	4	4	4	4	4	4	4	4		2	1
Nitric acid, fuming	4	4	4	4	4	4	4	4	4	4		2	1
Nitric acid, red, fuming	4	4	4	4	4	4	4	4	4	4	2	3	2
Nitric acid, red, fuming, with protective agent	4	4	4	4	4	4	4	4	4	4	2	3	2
Nitro thinner (petroleum ether), room temp.	4	4	4	2	3	1	2	1	4	1		1	1
Nitrobenzene	4	1	1	4	4	4	4	4	4	4	1	2	1
Nitrobenzene (petroleum ether)	4	4	4	1		2	2	1	4	1		1	
Nitrobenzene, 50°C	4			4		4	4		3				
1-chloro-1-nitroethane	4	4	4	4		4	4	4	4	4		4	1
Nitroethane	2	2	2	4	2	3	4	4	4	4	2	4	1
Nitrogen	1	1	1	1	1	1	1	1	1	1		1	1
Nitrogen tetroxide (N2O4)	4	4	4	4	4	4	4	4	4	4		4	1
Nitromethane	2	2	2	4	3	2	4	4	4	4		4	1
Nitropropane, room temp.	4	2	2	4	4	4		4	4	4		4	1
Nitrous oxide (laughing gas)			2	1	1				1			1	1
Nitrous oxide (laughing gas)			2	1	1				1			1	1
n-octane	4	4	4	2	2	2	4	4	4	2		1	1
n-propyl acetate (acetic acid propyl ester)	4	2	2	4	4	4	4	4	4	4		4	1
N-propyl acetone (methyl butyl ketone)	4	1	1	4	4	4	4	4	4	4		4	1
o-Chlornaphthalene	4	4	4	4		4	4	4	4	2		1	1
Octachlorotoluene	4	4	4	4	4	4	4	4	4	2		1	1
Octadecane	4	4	4	1	2	2	1	2	4	1		1	1
Octyl alcohol (octanol)	2	3	3	2	2	1	4	4	2	2		1	1
o-Dichlorobenzene	4	4	4	4		4	4	4	4	2		1	1
Oleic acid (oleic acid)	4	4	4	3	3	3	2	4	4		1	2	1
Oleum (fuming sulfuric acid)	4	4	4	4	4	4	4	4	4			1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Oleum spirit	4	4	4	2	2	3			4	2		1	1
Olive oil	4	2	2	1	2	2	1	1	3	1		1	1
Olive oil, 50°C	4			1		3	1		1				
Omo lye (2%), 100°C	4			4		4	4		4				
Oronite 8200	4	4	4	2	2	1	1		4	1		1	1
Oronite 8515	4	4	4	2	2	1	1		4	1		1	1
Ortho-Chloroethylbenzene	4	4	4	4	4	4	4	4	4	2		1	1
Ortho-dichlorobenzene	4	4	4	4	4	4	4	4	4	2		1	1
Ortho-n-octane	4	4	4	2	2	4	4	4	4	2		1	1
OS 45 type III (OS45)	4	4	4	2	2	1	4		4	2		1	1
OS 45 Type IV (OS45-1)	4	4	4	2	2	1	4		4	2		1	1
OS 70	4	4	4	2	2	1	4		4	2		1	1
Oxalic acid (ethanedioic acid, clover acid)	2	1	1	2	2	2			2	1		1	1
Oxygen, (93-204°C)	4	4	3	4	4	4	4	4	2	4		2	1
Oxygen, cold	2	1	1	2	1	1	1	2	1	1		1	1
Ozone	4	2	1	4	4	3	1	2	1	2		1	1
Paint solvent	4	4	4	4	4	4	4	4	4	4	4	4	1
Paint solvent (Phoron)	4	1	1	4	4	4	4	4	4	4		4	1
Paint thinner DUCOR	4	4	4	4	4	4	4	4	4	2		2	1
Palmitic acid (n-hexadecanoic acid)	2	2	2	1	3	2	1		4	1		1	1
Parker O-Lube	4	4	4	1	1	1	1	1	2	1		1	1
Parker Super O-Lube	1	1	1	1	1	1	1	1	3	1		1	1
p-cymene	4	4	4	4	4	4	4	4	4	2		1	1
p-Cymene (Cymol)	4	4	4	4	4	4	4	4	4	2		1	1
Peanut oil	4	3	3	1	2	3	2	1	1	1		1	1
Pentane (N-pentane)	4	4	4	1	1	3	1	1	4	1		1	1
Perchloric acid	4	2	2	4	2	2	4	4	4	3		1	1
Perchloroethylene (tetrachloroethylene), 20°C	4	4		4		4	3		4				
Perchloroethylene (tetrachloroethylene), 50°C	4			4		4	3		4				
Perchloroethylene (tetrachloroethylene), room temp.	4	4	4	4	4	4	4	4	4	2	4	1	1
Petrolatum (petroleum jelly)	4	4	4	1	1	2	1	1	4	1		1	1
Petroleum	4	4	4	1	1	3	3	1	3	1		1	1
Petroleum gas, liquid (LPG)	4	4	4	1	1	2	1	3	3	3		1	1
Petroleum oil	4	4	4	1	2	2	1	1	1	2		1	1
Petroleum oil, below 120°C	4	4	4	1	1	2	2	2	2	2		1	1
Petroleum oil, crude	4	4	4	1	1	2	1	1	4	1		1	1
Petroleum, < 121°C	4	4	4	1	2	2	2	2	2	2		1	1
Petroleum, > 121°C	4	4	4	4	4	2	4	4	4	4		2	1
Phenol (carbolic acid)	4	2	2	4	2	3	3	4	4	1	1	1	1
Phenyl ethyl ether	4	4	4	4	4	4	4	4	4	4		4	1
Phenyl hydrazine	3	2	2	4	4	4	4	4	4	2		2	1
Phenylbenzene	4	4	4	4	4	4	4	4	4	2		1	1
Phoron (diisopropylidene acetone)	4	3	3	4	4	4	4	4	4	4		4	1
Phosphoric acid, 20%	3	1	1	3	3	3	4	4	3	3		1	1
Phosphoric acid, concentrated	4	3	3	4	4	4	4	4	4	4	1	1	1
Phosphorus trichloride	4	1	1	4	4	4	4	4	4	2		1	1
Pickling solution	4	3	3	4	2	4	4	4	4	4		2	1
Picric acid (2,4,6-trinitrophenol)	2	2	2	2	2	1	2		4	2		1	1
Picric acid (aqueous solution)	1	1	1	1	1	1			2			1	1
Picric acid, 10%	3	3	1	3	3	1	4	4	4	3		1	1
Picric acid, molten	2	2	2	2	2	2			4	2		1	1
Pine oil, pine oil	4	4	4	1	1	4				1		1	1
Pinene	4	4	4	2	3	3	2	4	4	2		1	1
Pinene oil, room temp.	4	4	4	4	4	4			4	1	1	1	1
Piperidine (hexahydropyridine)	4	4	4	4	4	4	4	4	4	4		4	1
Plating solutions (except chromium), room temp.	4	1	1	4	1	1			4			1	1
Polyester plasticizer (Thiokol TP-90B)		1	1	4	4	2				2		1	1
Polyran M 25 N, 80°C	4			3		2	4		1				
Polyran M 400, 80°C	2			1		1	1		1				
Polyvinyl acetate emulsion	2	1	1	2	2	3							1
Potassium acetate (acetic potash)	1	1	1	2	2	2	4	4	4	4		4	1
Potassium acetate (aqueous solution)	1	1	1	2	1	2	4	4	4	4	1	4	1
Potassium canopruate (aqueous solution), room temp.	1	1	1	1	1	1	1	1	1	1		1	1
Potassium chloride (aqueous solution)	1	1	1	1	1	1	1	1	1	1	1	1	1
Potassium copper cyanide (aqueous solution)	1	1	1	1	1	1	1	1	1	1		1	1
Potassium cyanide (aqueous solution)	1	1	1	1	1	1	1	1	1	1		1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Potassium dichromate	1	1	1	1	1	1	2	1	1	1		1	1
Potassium dichromate (aqueous solution)	2	1	1	1	1	1	2	1	1	1		1	1
Potassium hydroxide (aqueous solution)	2	1	1	2	1	2	4	4	3	3	1	4	
Potassium hydroxide solution, 10%	3	1	1	3	3	3	4	4	4	4		4	1
Potassium hydroxide solutions (dil.)	1	1	1	2	2	2	4	4	2	2		2	1
Potassium hydroxide, 10%	2	1	1	2	2	2	4	4	3	3		4	1
Potassium hydroxide, potassium hydroxide, 50% solution	2	1	1	2	2	2	4	4	3	3		4	1
Potassium nitrate (aqueous solution)	1	1	1	1	1	1	1	1	1	1	1	1	1
Potassium perchlorate (aqueous solution)	4	1	1	4	4	1	4	4	4	4		1	1
Potassium salts	1	1	1	1	1	1	1	1	1	1		1	1
Potassium sulfate (aqueous solution)	2	1	1	1	2	1	1	4	1	1		1	1
Potassium sulfite	2	1	1	1	1	1	1	4	1	1		1	1
Prestone ® Antifreeze	1	1	1	1	1	1	4	4	1	1		1	1
Pri High Temp. hydr. oil	4	4	4	2	2	2	2	1	2	1		1	1
Processed cheese 60% fat in dry matter			1	1	1				1			1	1
Product gas, room temp.	4	4	4	2	2	1	1	2	2	2		1	1
Propane	4	4	4	1	2	2	3	1	4	2		1	1
Propanol (l), 50°C	1			2		1	3		3				
Propanol (l), 80°C	4			4		2	4		3				
Propanol, room temp.	1	1	1	1	1	1	4	4	1	1	1	1	1
Propyl alcohol (propanol)	1	1	1	1	1	1	4	4	1	1	1	1	1
Propyl nitrate	4	2	2	4	4	4		4	4	4		4	1
Propylamine, 20°C	4			4		4	4		4				
Propylene (propene)	4	4	4	4	4	4	4	4	4	3		1	1
Propylene oxide	4	3	3	4	4	4	4	4	4	4		4	1
PYDRAUL 10E, 29ELT	4	1	1	4	4	4	4	4	4	4		1	1
PYDRAUL 115E	4	1	1	4	4	4	4	4	4	3		1	1
PYDRAUL 230C, 312C, 540C	4	4	4	4	4	4	4	4	4	4	4	1	1
PYDRAUL 30E, 50E, 65E, 90E	4	1	1	4	4	4	4	4	1	1		1	1
PYDRAUL F9, 80°C	4			4		4	4		2				
Pyranol transformer oil	4	4	4	1	3	2	2	1	4	1		1	1
Pyridine	4	2	2	4	4	4	4	4	4	4		4	1
Pyrogard 42, 43, 53, 55 (phosphate ester, HFDR)	4	1	1	4	4	4	4	4	4	4		1	1
Pyrogard C, D	4	4	4	1	1	2	4	4	2	2		1	1
Pyrolignic acid	4	2	2	4		2	4	4		4		4	
Pyrolube	4	2	2	4	4	4	4	4	2	2		1	1
Pyrrole	3	4	4	4	4	4	4	4	4	2		4	1
Radiation	3	4	2	3		2	3	3	3	4		3	
Raspberry essence (flavoring agent)			1	3	3				1	2		1	1
Red Line 100 Oil	4	4	4	1	1	2	1	1	4	1		1	1
Red oil (aniline), room temp.	4	1	1	4	2	4	4	4	4	3	1	3	1
Red Oil (Mil-H-5606)	4	4	4	1	1	2	1	1	4	1		1	1
Refrigerant R 11	4	4	4	2	2	3			4			2	4
Refrigerant R 112	4	4	4	2	2	2			4			1	2
Refrigerant R 113	4	4	4	1	1	1	1		4			2	4
Refrigerant R 114	1	1	1	1	1	1			4			1	4
Refrigerant R 114 B2	4	4	4	2	2	1			4			2	4
Refrigerant R 115	1	1	1	1	1	1						1	4
Refrigerant R 12	2	2	2	1	1	1	1		4	4		1	4
Refrigerant R 12, ASTM Oil No. 2, 1:1	4	4	4	2	2	3			4	2		1	3
Refrigerant R 12: Suniso 4G, 1:1	4	4	4	2	2	3			4	2		1	3
Refrigerant R 13	1	1	1	1	1	1			4	4		1	4
Refrigerant R 13 B1	1	1	1	1	1	1			4	2		1	4
Refrigerant R 134a			1	2	1	1						4	
Refrigerant R 14	1	1	1	1	1	1	1		4			1	4
Refrigerant R 21	4	4	4	4	4	2			4			4	2
Refrigerant R 22	1	1	1	4	4	1	4	2	4	2		4	2
Refrigerant R 22, ASTM oil no. 2, 1:1	4	4	4	4	4	2		2	4	2		2	2
Refrigerant R 31	2	1	1	4	4	1						4	2
Refrigerant R 32	1	1	1	1	1	1						4	2
Refrigerant R 502	1	1	1	2	2	1						2	4
Rimula oil 20 W/20, 100°C	4			1		3	1		2				
RJ-1 (Mil-F-25558)	4	4	4	1	1	2	1	1	4	1		1	1
RJ-1 (Mil-F-25558B)	4	4	4	1	1	2	1	1	4	1		1	1
Rocking lye (2%), 100°C	4			4		4	4		4				
RP-1 (Mil-R-25576)	4	4	4	1	1	2	1	1	4	1		1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
RP-1 (Mil-R-25576C)	4	4	4	1		2	1	1	4	1		1	1
Sacharose solution (cane sugar)	1	1	1	1	2	2	4	4	1	1		1	1
Sacharose sugar concentrate, room temp.	1	1	1	2	1	1	4	4	1	1		1	1
Salicylic acid (2-hydroxybenzoic acid)	1	1	1	2	1	1				1		1	1
Salmiak (ammonium chloride)	1	1	1	1	1	1	1	1	2	1		1	1
Salt water	1	1	1	1	1	2	2	4	1	1		1	1
Santo Safe 300	4	3	3	4	4	4		4	1	1		1	1
Sea (salt) water	1	1	1	1	1	2	4	4	1	1			1
Sea (salt) water	1	1	1	1	1	2	4	4	1	1			1
Sea water, artificial, 20°C	1			1		1	3		1				
Shell 3XF Mine Fluid	4	4	4	1	1	2	4	4		1		1	1
Shell Alvania grease No. 2	4	4	4	1	1	3	1	1	3	1		1	1
Shell Carnea 19 and 29	4	4	4	1	1	4	2	1		1		1	1
Shell Darina No. 2, 100°C	4			1		4	4		2				
Shell Diala	4	4	4	1	1	2	2	1	4	1		1	1
Shell Gear oil 90, 100°C	4			1		3	3		1				
Shell gear oil Hyp 90, 100°C	4			4		4	4						
Shell Iris 905	4	4	4	1	1	2	1	1	4	1		1	1
Shell Lo Hydrax 27 and 29	4	4	4	1	1	2	2	1	4	1		1	1
Shell Macoma 72	4	4	4	1	1	2	2	1	4	1		1	1
Shell Spirax EP 90, 100°C				1									
Shell Tellus No. 27 (petroleum base)	4	4	4	1	1	2	1	1	4	1		1	1
Shell Tellus No. 33	4	4	4	1	1	2	1	1	4	1		1	1
Shell Tellus oil 46, 100°C				1									
Shell UMF (5% aromatic)	4	4	4	1	1	2	1	1	4	1		1	1
Shell Unede No.3, 50°C	4			1		4	1		2				
Silicate ester	4	4	4	2	2	1	1		4	1		1	1
Silicic acid ester, room temp.	4	4	4	1	1	2	1		4	1		1	1
Silicofluoric acid	1	1	1	2	2	2			4	4		1	1
Silicone grease	1	1	1	1	1	1	1	1	3	1		1	1
Silicone oil	1	1	1	1	1	1	1	1	3	1		1	1
Silver nitrate	1	1	1	2	2	1	1	1	1	1		1	1
Silver nitrate (aqueous solution)	1	1	1	3	3	1	4	4	1	1		1	1
Sinclair Opaline CX-EP Lube	4	4	4	1	1	2	1	1	4	1		1	1
Skelly, Solvent B, C, E	4	4	4	1	1	4				1		1	1
Skydrol 500	4	2	1	4	4	4	4	4	3	3	2	4	1
Skydrol 7000	4	1	1	4	4	4	4	4	3	3		2	1
Soap solution	2	1	1	1	2	2	3	4	1	1		1	1
Soap solution (aqueous solution)	3	1	1	1	1	3	4	4	1	1		1	1
Socony Mobile Type A	4	4	4	1	1	2	2	1	4	2		1	1
Socony Vacuum AMVAC781 (lubricant)	4	4	4	1	1	2	2	1	4	2		1	1
Socony Vacuum PD959B	4	4	4	1	1	2	1	1	4	1		1	1
Soda Ash (Sodium Acetate)	1	1	1	2	2	2	3	3	4	4		4	1
Soda Ash (sodium carbonate)	1	1	1	1	1	1			1	1		1	1
Soda ash, free of crystalline water	1	1	1	1	1	1			1	1		1	1
Soda ash, ramp.	1	1	1	1	1	1			1	1		1	1
Sodium acetate (aqueous solution)	1	1	1	2	1	2	4	4	4	4		4	1
Sodium bicarbonate (aqueous solution)	1	1	1	1	1	1			1	1		1	1
Sodium bisulfate	1	1	1	1	1	1	1	4	1	1		1	1
Sodium bisulfite (aqueous solution)	1	1	1	1	1	1	4	4	1	1	1	1	1
Sodium borate (aqueous solution)	1	1	1	1	1	1	4	4	1	1	1	1	1
Sodium cake	1	1	1	1	1	1	1	4	1	1		1	1
Sodium carbonate (aqueous solution) (soda)	1	1	1	1	1	1	4	4	1	1		1	1
Sodium chloride (aqueous solution)	1	1	1	1	1	1	4	4	1	1	1	1	1
Sodium cyanide (aqueous solution)	1	1	1	1	1	1	4	4	1	1		1	1
Sodium hydrogen carbonate (aqueous solution), (baking powder, room temp.)	1	1	1	1	1	1	1		1	1		1	1
Sodium hydrogen sulfite (aqueous solution), room temp.	1	1	1	1	1	1		4	1	1	1	1	1
Sodium hydroxide (aqueous solution)	1	1	1	2	1	1	4	3	2	2	1	2	1
Sodium hydroxide solution, 20°C	2	1	1	2	2	2		3	3	3		3	1
Sodium hydroxide, 10% (caustic soda)	1	1	1	3	3	1	4	4	4	4		4	1
Sodium hydroxide, 25%	1	1	1	3	3	1	4	4	4	4		4	1
Sodium hypochlorite (aqueous solution)	4	2	2	2	1	1	4	4	2	2	1	1	1
Sodium hypochlorite, 20%	2	2	2	2	2	4	4	4	2	2		1	1
Sodium metaphosphate (aqueous solution)	1	1	1	1	1	2				1		1	1
Sodium metasilicate	1	1	1	1	1	1						1	1
Sodium nitrate (aqueous solution)	2	1	1	2	1	2			4		1	1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Sodium perborate (aqueous solution)	2	1	1	2	2	2	4	4	2	1		1	1
Sodium peroxide (aqueous solution)	2	1	1	2	2	2	4	4	4	1		2	1
Sodium phosphate (aqueous solution)	1	1	1	1	1	2	1	1	4		1	1	1
Sodium phosphate, primary	1	1	1	1	1	2	1	1	4			1	1
Sodium phosphate, secondary	1	1	1	1	1	2	1	1	4			1	1
Sodium phosphate, tertiary	1	1	1	1	1	2	1	1	1			1	1
Sodium salts	1	1	1	1	1	2	1	1	1	1		1	1
Sodium silicate (aqueous solution)	1	1	1	1	1	1					1	1	1
Sodium sulfate (aqueous solution)	2	1	1	1	1	1	1	4	1	1	1	1	1
Sodium sulfide (aqueous solution)	3	1	1	1	1	1	4	4	1	1		1	1
Sodium sulfite	2	1	1	1	1	1	1	4	1	1		1	1
Sodium thiosulfate (aqueous solution)	2	1	1	2	1	1	1	4	1	1		1	1
Solvent (Stoddard Solvent)	4	4	4	1	1	2	1	1	4	1		1	1
Somat lye 0.2%, 100°C	4			4		4	4		3				
Sovasol No. 1, 2 and 3	4	4	4	1	1	2	2	2	4	1		1	1
Sovasol No. 73 and 74	4	4	4	2	2	2	2	2	4	1		1	1
Soybean oil (Soybean oil)	4	3	3	1	3	2	2	1	1	1		1	1
Spirit	1	1	1	1		1	4	4	1	1		1	1
Spry	4	2	2	1	1	2	1	1	1	1		1	1
SR-10 Fuel	4	4	4	1	1	4	2	2	4	1		1	1
SR-6 Fuel	4	4	4	2	2	4	2	2	4	1		1	1
Standard Oil Mobilube GX9	4	4	4	1	1	2	1	1	4	1		1	1
Stannoethylmorpholine		2	2	4	4							4	1
Stauffer 7700	4	4	4	2	2	4		2	4	2		1	1
Stearic acid (octadecanoic acid)	2	2	2	2	2	3	4	4	2		1	1	1
Stoddard solvent	4	4	4	1	1	2	1	1	4	1		1	1
Styrene, monomer (phenylethylene)	4	4	4	4	4	4	4	4	4	4	2	3	1
Succinic acid	1	1	1	1	1	1	4	4	2	2		1	1
Sugar beet juice	1	1	1	1	1	1	4	4	1	1		1	1
Sugar cane solution	1	1	1	1	1	2	4	4	1	1		1	1
Sulfite liquor	2	2	2	2		2		4	4	2		1	1
Sulfite liquor, room temp.	2	2	2	2	2	2		4	4	2		1	1
Sulfur	4	1	1	4	1	1		4	3	1		1	1
Sulfur chloride (aqueous solution)	4	4	4	4	4	4		4	3	1		1	1
Sulfur dioxide (dry)	2	2	1	4	4	4		4	2	2	2	4	1
Sulfur dioxide (liquid under pressure)	4	2	1	4	4	4		4	2	2		2	
Sulfur dioxide (wet)	4	1	1	4	4	2		4	2	2		4	1
Sulfur dioxide, room temp.	4			4		4			2				
Sulfur hexafluoride	4	1	1	2	2	1	2	4	2	2		1	2
Sulfur trioxide	2	2	2	4	4	4	4	4	3	3		1	1
Sulfur, molten	4	4	4	4	4	4	4	4	4	4		1	1
Sulfuric acid	2	2	2	2	2	2		4	4	2		1	1
Sulfuric acid (20% oleum)	4	4	4	4	4	4	4	4	4	4	1	1	1
Sulfuric acid (concentrated)	4	4	3	4	1	4	4	4	4	4	1	1	1
Sulfuric acid (diluted)	3	2	2	3	1	2	3	2	4	3	1	1	1
Sulfuric acid 10%, 100°C	4			4		3			4				
Sulfuric acid 10%, 50°C	1			1		1	4		1				
Sulfuric acid 25%, 100°C	4			4		3	4		4				
Sulfuric acid 25%, 50°C	2			1		2	4		2				
Sulfuric acid 50%, 100°C	4			4		4	4		4				
Sulfuric acid 50%, 50°C	4			4		2	4		4				
Sulfuric acid, 3-molar	3	3	2	4	4	3	3	2	4	3		1	1
Sulfuric acid, 96	4	4	4	4	4	4	4	4	4			1	1
Sulfuric acid, concentrated	4	4	4	4	4	4	4	4	4	4		1	1
Sulfuric acid, fuming (20/25% oleum)	4	4	4	4	4	4	4	4	4	4		1	1
sulfurous acid	3	2	2	3	3	3	4	4	4	4		3	1
Sunil lye (2%), 100°C	4			4		4	4		4				
Sunoco SAE 10	4	4	4	1	4	2	1	1	4	1		1	1
Sunoco, all available greases	4	4	4	1	4	2	1	1	4	1		1	1
Sunsaft (fire resistant hydraulic fluid)	4	4	4	1	1	2	4	4		1		1	1
Super Gasoline	4	4	4	2	1	2	2	2	4	2		1	1
Super Shell Gas	4	4	4	1	1	2	2	2	4	2		1	1
Swan Finch EP Lube	4	4	4	1	1	4	1	1	4	1		1	1
Swan Hypoid-90	4	4	4	1	1	2	1	1	4	1		1	1
Tannic acid	1	1	1	1	1	1	4	4	1	1		1	1
Tar oil (coal tar), room temp.	4	4	4	2	4	1	3	1	4	1		1	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Tar oil, carbolineum	4	4	4	1	1	2	3	1	4	1		1	1
Tar, Bituminous	4	3	3	2	4	3		4	2	1		1	1
Tartaric acid	3	2	2	1	1	2	1	4	1	1		1	1
Tectal (crude tar acid), 20°C	4			4		4	4		4				
Tertiary butyl alcohol	2	2	2	2	2	2	4	4	2	2		1	1
Tertiary butyl mercaptan	4	4	4	4	4	4		4	4			1	1
Tetrabromomethane (carbon tetrabromide)	4	4	4	4	4	4	4	4	4	3		1	1
Tetrabutyl titanate	2	2	1	2	2	2				1		1	1
Tetrachloroethane	4	4	4	4	4	4	4	4	4	4		3	1
Tetrachloroethylene (Per)	4	4	4	4	4	4	4	4	4	2	4	1	1
Tetraethyl lead (lead tetraethyl)	4	4	4	3	3	4	4	4	4	3		1	1
Tetraethyl lead blend	4	4	4	2	2	4				2		1	1
Tetrahydrofuran (THF)	4	3	3	4	4	4	3	4	4	4		4	1
Tetrahydrofuran, 20°C	4			4		4	4		4				
Tetrahydrofuran, 50°C	4			4		4	4		4				
Tetralin (tetrahydronaphthalene)	4	4	4	4	4	4			4	1		2	1
Texaco 3450 (gear oil)	4	4	4	1	1	4	1	1	4	1		1	1
Texaco Capella A and AA	4	4	4	1	1	2	2	1	4	1		1	1
Texaco Meropa No. 3	4	4	4	1	1	2	2	1	4	1		1	1
Texaco Regal B	4	4	4	1	1	4	1	1	4	1		1	1
Texaco Uni-Temp. lubricant	4	4	4	1	1	2	1	1	2	1		1	1
Texamatic „A“ Gear oil	4	4	4	1	1	2	2	1	4	2		1	1
Texamatic 1581 Fluid	4	4	4	1	1	2	2	1	4	2		1	1
Texamatic 3401 Fluid	4	4	4	1	1	2	2	1	4	2		1	1
Texamatic 3525 Fluid	4	4	4	1	1	2	2	1	4	2		1	1
Texamatic 3528 Fluid	4	4	4	1	1	2	2	1	4	2		1	1
Texas 1500 Oil	4	4	4	1	1	2	1	1	2	1		1	1
Textile cleaning fluid	4	4	4	3	4	4	4	4	4	2		1	2
Thiokol TP-90B (polyester softener)		1	1	4	4	2				2		1	1
Thiokol TP-95		1	1	4	4	2				2		1	1
Thionyl chloride (sulfuric acid dichloride)	4	4	3	4	4	4	4	4				2	1
Tidewater Multigear 140, EP-Lube	4	4	4	1	1	2	1	1	4	1		1	1
Tidewater Oil-Beedol	4	4	4	1	1	2	1	1	2	1		1	1
Tin chloride (aqueous solution)	1	1	1	1	1	1	4	4	1	1		1	1
Tin tetrachloride (aqueous solution)	1	1	1	1	1	2			2	1		1	1
Tin(II) chloride	1	1	1	1	1	1			2	1		1	1
Tin(IV) chloride	1	1	1	1	1	4			2	1		1	1
Tin(IV) chloride, 50% solution	1	1	1	1	1	4			2	1		1	1
Titanium tetrachloride	4	4	4	2	4	4	4	4	4	2		1	1
Toluene (methylbenzene)	4	4	4	4	4	4	4	4	4	3	4	2	1
Toluene diisocyanate (TDI)	4	2	2	4		4		4	4	4		4	1
Toluene diisocyanate, room temp.	4	2	2	4	4	4	4	4	4	4		4	1
Toluene, 20°C	4			4		4	3		4				
Toluene, 50°C	4			4		4	4		4				
Transformer oil	4	4	4	1	3	2	1	2	2	1		1	1
Transformer oils (petroleum-based)	4	4	4	1	1	3	1	3	3	1		1	1
Transmission fluid type A	4	4	4	1	2	2	1	1	2	1		1	1
Triacetin (glycerol triacetate)	2	1	1	2	2	2	4	4		4		4	1
Triaryl phosphate, room temp.	4	1	1	4	4	4	4	4	3	2		1	1
Tributoxyethyl phosphate	2	1	1	4	4	4	4	4		2		1	1
Tributyl mercaptan	4	4	4	4	4	4		4	4	3		1	1
Tributyl phosphate (TBP)	3	2	2	4	4	4	4	4	4	4	1	4	1
Trichloroacetic acid (TCA)	4	2	2	2	4	4	4	4	4	4		4	1
Trichloroethane	4	4	4	4	4	4	4	4	4	2		1	1
Trichloroethane, 20°C	4			4		4	4		4				
Trichloroethane, 50°C	4			4		4	4		4				
Trichloroethylene (trichloroethene, tri) (TCE)	4	4	4	4	4	4	4	4	4	3	4	1	1
Trichloromethane (chloroform)	4	4	4	4	4	4	4	4	4	2		1	1
Tricresyl phosphate (TCP)	4	1	4	4	4	4	4	4	3	2	1	1	1
Triethanolamine (TEA)	2	2	2	3	3	2	4	4		4	1	4	2
Triethylaluminum (Aluminiumtriethyl)	4	3	3	4	3	4	4	4				2	1
Triethylamine, 20°C	4			3		4	2		4				
Triethylborane	4	3	3	4	4	4	4	4				1	1
Trifluoroethane	4	4	4	4	4	4	4	4	4	2		1	1
Trinitrotoluene (TNT)	4	4	4	4	4	3		4		3		2	1
Trioctyl phosphate	4	1	1	4	4	4	4	4	4	3		3	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Tripene, 20°C	4			4		4	2		4				
Tripolyphosphate	4	1	1	4	4	3	4	4	3	1		1	1
Tung oil (China wood oil)	4	3	4	1	2	2	3		4	2		1	1
Turbine oil	4	4	4	2	4	4	1	1	4	2		1	1
Turbine Oil No. 15 (Mil-L-7808)	4	4	4	2	2	4	4	2	4	2		1	1
Turbo Oil No. 35	4	4	4	1	1	2	1	1	4	1		1	1
Turpentine	4	4	4	1	4	4	4	2	4	2	3	1	1
Turpentine oil	4	4	4	1	1	4	4	3	4	2		1	1
Turpeneol	4	3	3	2	4	4	2			1		1	1
Type I Fuel (Mil-S-3136)	4	4	4	1	1	2	1	2	4	1		1	1
Type II Fuel (Mil-S-3136)	4	4	4	2	2	4	2	4	4	2		1	1
Type III Fuel (Mil-S-3136)	4	4	4	1	1	4	2	4	4	1		1	1
Ucon Grease 50-HB-100	1	1	1	1	1	1			1	1		1	1
Ucon Grease 50-HB-260	1	1	1	1	1	1			1	1		1	1
Ucon Grease 50-HB-5100	1	1	1	1	1	1			1	1		1	1
Ucon Grease 50-HB-55	1	1	1	1	1	1			1	1		1	1
Ucon Grease 50-HB-660	1	1	1	1	1	1			1	1		1	1
Ucon Grease LB-1145	1	1	1	1	1	1			1	1		1	1
Ucon Grease LB-135	1	1	1	1	1	1			1	1		1	1
Ucon Grease LB-285	1	1	1	1	1	1			1	1		1	1
Ucon Grease LB-300X	1	1	1	1	1	1			1	1		1	1
Ucon Grease LB-625	1	1	1	1	1	1			1	1		1	1
Ucon Grease LB-65	2	1	1	1	1	1			1	1		1	1
Ucon Hydrolube 275 CP, 80°C	3			1		2	4		4				
Ucon Hydrolube J-4		1	1	1	1	2	4	4	1	2		1	1
Ucon Oil 50-HB-280X	1	1	1	1	1	1			1	1		1	1
Ucon Oil LB-385	1	1	1	1	1	1			1	1		1	1
Ucon Oil LB-400X	1	1	1	1	1	1			1	1		1	1
Univis 40 (hydraulic fluid)	4	4	4	1	1	2	1	1	4	1		1	1
Univolt No. 35 (mineral oil)	4	4	4	1	1	2	1	1	4	1		1	1
Unsymmetrical Dimethylhydrazine (UDMH)	1	1	1	2	2	2			4	4		4	2
Urea, aqueous	1	1	1	1	1	1	4	4	1	1		1	1
Vapor above 150°C	4	4	3	4	4	4	4	4	4	4		4	1
Vapor below 150°C	4	2	1	3	4	4	4	4	3	4	1	2	1
Varnish	4	4	4	2	4	4	3	4	4	2		1	1
Varnish (cellulose varnish)	4	4	4	4		4	4	4	4	4		4	1
Varnish, room temp.	4	4	4	4	4	2	3	4	4	2		1	1
Vaseline	4	4	4	1	1	3	1	1	1	1		1	1
Vegetable oil	4	3	3	1	2	3		1	2	1		1	1
Versilube F-50	1	1	1	1	1	1	1	1	3	1		1	1
Vinegar	2	1	1	2	1	2	4	4	1	3		1	1
Vinyl acetylene (1-butene-3-in), room temp.	2	2	2	2	2	1			2			1	1
Vinyl chloride (chloroethylene, chloroethene)	4	4	4	4	4	4	4	4			2	1	1
VV-H-910	2	2	1	3	3	2	4	4	2	2		1	1
WAGNER 21B Brake fluid	2	2	1	3	3	2			3	4		4	1
Waste water (according to DIN 4045)	2	2	2	1	1	2	4	4	2	1		1	1
Water	1	1	1	1	1	1	3	4	1	1	1	1	1
Water (service water) up to 100°C	3	1	1	2	1	3	4	4	3	2		2	1
Water (service water) up to 70°C	1	1	1	1	1	2	4	4	1	1		1	1
Water distilled, 100°C	4			2		4	4		4				
Water distilled, 20°C	2			1		2	3		1				
Water distilled, 50°C	4			2			4		3				
Water vapor (< 149°C)	4	2	1	4	4	4	4	4	4	4	1	4	1
Water vapor (> 149°C)	4	4	3	4	4	4	4	4	4	4		4	1
Water, heavy	1	1	1	1	1	2	4	4	1	1		1	1
Wemco C	4	4	4	1	1	2	1	1	4	1		1	1
Whiskey & Wine	1	1	1	1	1	1	4	4	1	1		1	1
white oils, room temp.	4	4	4	2	4	1	1	1	4	1		1	1
white pine oil, room temp.	4	4	4	4	4	2			4	1		1	1
Wine, white wine, red wine	1	1	1	1	1	1	4	4	1	1		1	1
Wolmansalz® (wood impregnation)	1	1	1	1	1	2	1	2	1	1		1	1
Wood alcohol (methanol)	1	1	1	1	1	1	4	4	1	1		4	1
Wood impregnation (Wolmansalz®)	1	1	1	1	1	2	1	2	1	1		1	1
Wood oil (Tung oil)	4	4	4	1	1	3	3	1	4	3		1	1
Wood oil, room temp.	4	4	4	2	3	1	3	1	4	2		1	1
Wood vinegar, room temp.	4	2	2	2	2	4	4	4		4		4	1

MEDIA RESISTANCE TABLE FOR ELASTOMERS

Medium	NR	IIR	EPDM	NBR	HNBR	CR	PU/AU	ACM	VMQ	FVMQ	TFE/P	FKM	FFKM
Xenon	1	1	1	1	1	1	1	1	1	1		1	1
Xylene (xylene, dimethylbenzene)	4	4	4	4		4	4	4	4	1	3	1	1
Xylene, room temp.	4	4	4	4	4	4	4	4	4	1	3	1	1
Xylidenes (mixture of aromatic amines)	4	4	4	3	3	4	4	4	4	4		4	1
Xylidine (aminoxylene, dimethylaniline)	3	3	2	3	4	3	4	4	4	4		4	1
Yeast, aqueous	1	1	1	1	1	1	4	4	1	1		1	1
Zeolite	1	1	1	1	1	1				1		1	1
Zinc acetate (aqueous solution)	1	1	1	2	2	2	4	4	4	4		4	1
Zinc chloride (aqueous solution)	1	1	1	1	1	1	1	4	1	1	1	1	1
Zinc salts	1	1	1	1	1	1	1	4	1	1		1	1
Zinc sulfate (aqueous solution)	2	1	1	1	1	1		4	1	1	1	1	1

20. STORAGE OF ELASTOMERS

Depending on the influence of heat, light, ozone, oxygen and moisture, most vulcanized elastomers tend to change their physical properties during storage. Improper storage can cause damage to rubber products such as: Hardening, softening, cracking or other changes that make the products impossible to use. By carefully observing the points listed below, the changes described can be largely avoided. (see also DIN 7716)

Temperature

The temperature in the storage room should be between +15° and +25°C, which should not be exceeded. Storage temperatures below 0°C up to a maximum of -10°C for short periods are not harmful in the long term. However, if elastomers are taken from storage at temperatures below zero, they should be warmed up slowly to approx. 20°C before use or inspection. Chloroprene rubbers (CR) should not be stored below +12°C.

Oxygen – Ozone

If possible, vulcanized elastomers should be protected from circulating air by suitable packaging, e.g. airtight films or PE sealing bags. This should be taken into account especially for parts with a large surface area and large volume, since ozone particularly attacks rubber. Storage rooms should not contain any electrical equipment that can generate sparks or discharges, e.g. high-voltage equipment, transformers or electric motors.

Ambient air

The optimum humidity is about 65%, and should not exceed this significantly. The ambient air should be as dust-free as possible. There should be a moderately ventilated atmosphere.

Light

Vulcanized elastomers should be stored away from direct sunlight and UV light. Unless these products are packed in light-impermeable containers or special films/bags, the windows of the storage rooms should be covered with UV-protective film.

Deformation

Elastomer products should be stored in such a way that they cannot deform. Unnecessary pressure or elongation should be kept to a minimum. Items should be stored as flat as possible to prevent permanent deformation.

Contact with metals

Metals such as copper, copper compounds, manganese and steel can have a destructive effect on elastomers if they come into direct contact with them. Paper, cardboard, polyethylene film or similar can be placed between the contact surfaces for protection.

Contact with liquid and semi-liquid media

Elastomers should not come into contact with liquid or semi-liquid media during storage. This applies in particular to solvents, oils and greases, unless they have been packaged in this way by the manufacturer. When storing equipment with built-in elastomer parts, only preservatives compatible with the elastomers in question should be used.

Cleaning

Elastomeric products should be cleaned with a clean cloth and lukewarm soapy water. Gasoline, benzene, turpentine and similar organic solvents are not suitable. Do not bring into contact with sharp-edged or pointed objects, such as wire brushes or sandpaper. Elastomers must be dried before use at room temperature, not in the direct vicinity of radiators.

Storage handling

Elastomer products should be stored for as short a time as possible. For this purpose, the „first in - first out“ principle should be applied when removing from storage. This means that the products that are stored first should also be used up first.

Storage time

The polymer used in the elastomer compound determines the expected service life of the finished parts. The storage time on the shelf (under the optimum conditions described above) can be taken from the following table. Before use, or when the initial storage time is reached, a careful check should be made according to the following criteria:

- are mechanical destructions visible
- are deformations/changes visible
- are surface changes/hairline cracks visible
- are hardness changes detectable by means of a measurement

Base elastomer	Initial storage time	Second storage period (after control)
Fluoroelastomers (FKM) / Perfluoroelastomers (FFKM) Fluorosilicones (FVMQ) Chlorosulfonated PE	10 years	4 years
Neoprene (CR) Ethylene Propylene Diene (EPDM) Nirtil/PVC blend	5 years	2 years
Nature rubber Nitrile (NBR) Butyl (IIR) Polyurethane (PU) Styrene Butadiene Rubber (SBR)	3 years	2 years